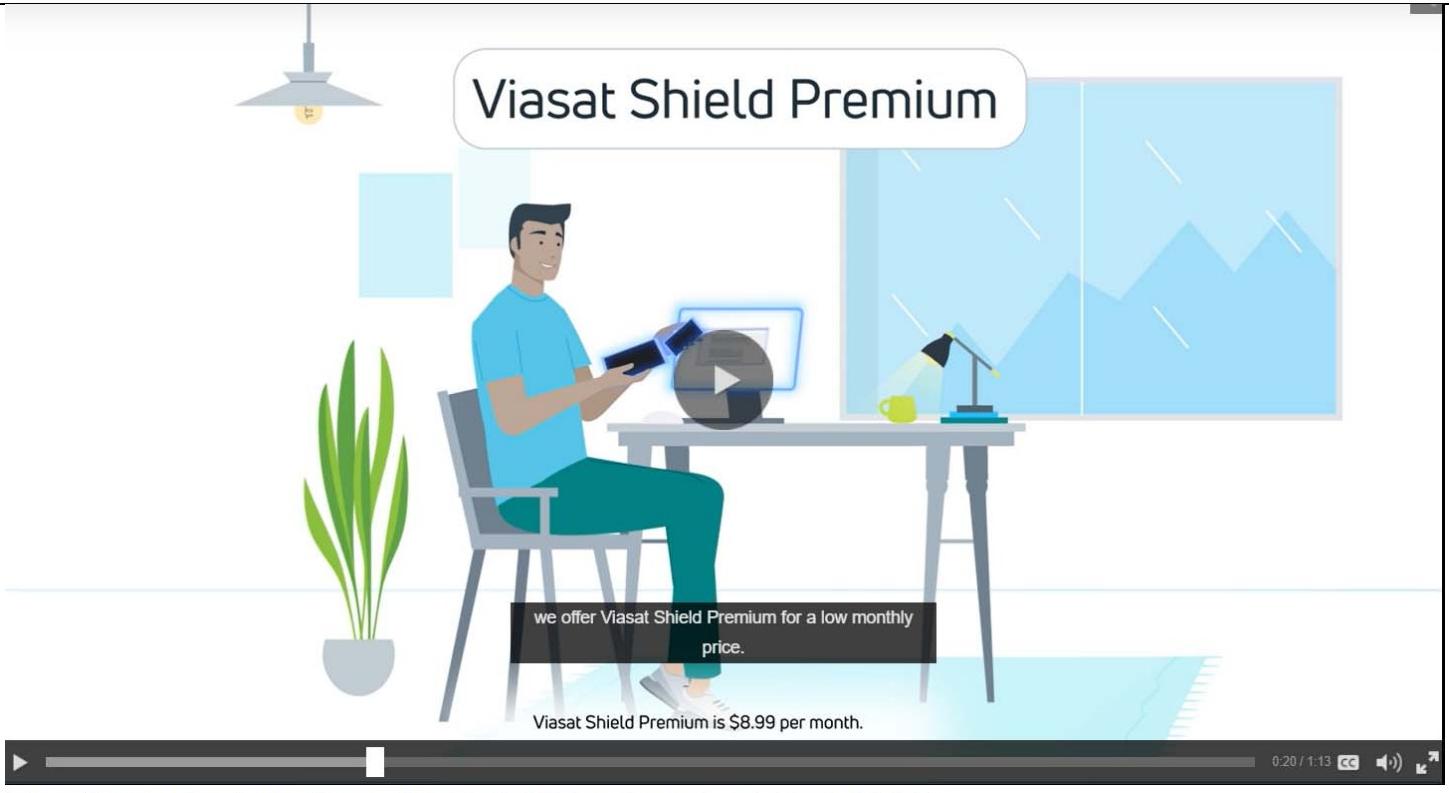


**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
<p>1. A method comprising: mapping, with at least one processor, each of a plurality of data streams related to a specific content to a different component of a service delivering multiple versions of the specific content;</p>	<p>The defendant streams videos making use of HTTP live streaming (HLS) standard (hereinafter referred to as the standard).</p> <p><b>ViaSat (“Accused Instrumentality”)</b></p> <p>The defendant streams videos making use of HTTP live streaming (HLS) standard (hereinafter referred to as the standard).</p>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	 <p>Viasat Shield Premium</p> <p>we offer Viasat Shield Premium for a low monthly price.</p> <p>Viasat Shield Premium is \$8.99 per month.</p> <p>0:20 / 1:13 CC</p> <p><a href="https://www.viasat.com/home-internet/additional-services/viasat-shield/">https://www.viasat.com/home-internet/additional-services/viasat-shield/</a></p> <p>The accused standard discloses a method which comprises mapping, with at least one processor (e.g., processor/transcoder of a server of an HLS service provider), each of a plurality of data streams (e.g., media streams such as audio, video, captions, etc.) related to a specific content (e.g., streaming content such as web streaming) to a different component (e.g., Index file m3u8) of a service (e.g., web streaming) delivering multiple versions (e.g., M3U8 Manifest File comprises multiple versions of a data stream) of the specific content (e.g., streaming content such as web streaming).</p>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	As shown below, a server of an HLS service provider converts plurality of data streams such as audio, video, etc. of a streaming content (e.g., specific content) in multiple streams at different bitrates and resolutions in different media segments of a M3U8 Manifest File. For example a media segment may consist of representation of videos and audios. Similarly, different media segments contain many different representations.

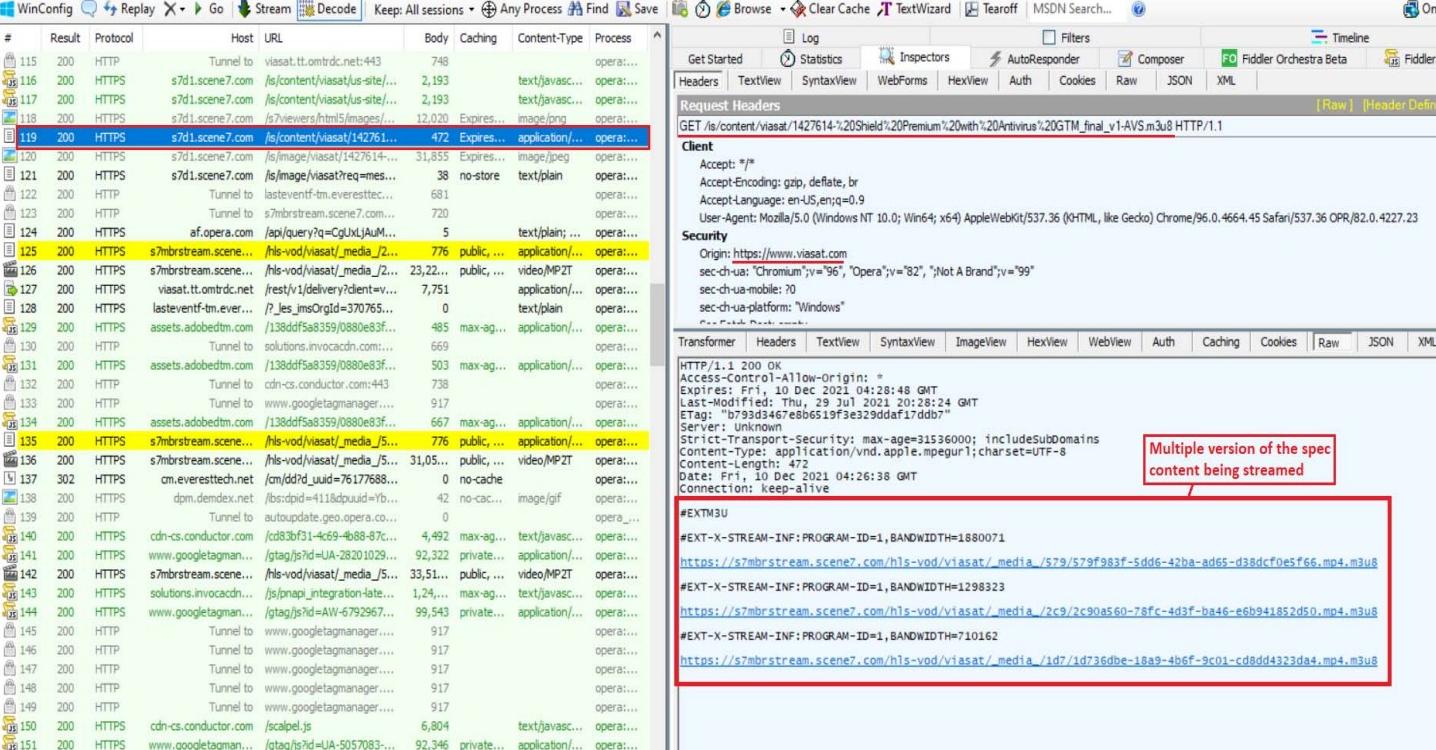
**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <div style="border: 1px solid #ccc; padding: 10px; background-color: #f9f9f9;"> <p><b>Request Headers</b> [Raw] [Header Definition]</p> <p>GET /hls-vod/viasat/_media_/2c9/2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4.m3u8 HTTP/1.1</p> <p><b>Client</b></p> <pre>Accept: */* Accept-Encoding: gzip, deflate, br Accept-Language: en-US,en;q=0.9 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.45 Safari/537.36 OPR/82.0.4227.23</pre> <p><b>Security</b></p> <pre>Origin: https://www.viasat.com sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99" sec-ch-ua-mobile: ?0 sec-ch-ua-platform: "Windows" Sec-Fetch-Dest: video</pre> <p>Transformer Headers TextView SyntaxView ImageView HexView WebView Auth Caching Cookies Raw JSON XML</p> <pre>HTTP/1.1 200 OK Content-Type: application/vnd.apple.mpegurl Content-Length: 776 Last-Modified: Thu, 01 Jan 1970 00:00:00 GMT Access-Control-Allow-Origin: * X-Cache-Hits: 0 Accept-Ranges: bytes Cache-Control: public, no-transform, must-revalidate, proxy-revalidate, max-age=537779 Expires: Thu, 16 Dec 2021 09:49:38 GMT Date: Fri, 10 Dec 2021 04:26:39 GMT Connection: keep-alive Vary: Accept-Encoding  #EXTM3U #EXT-X-MEDIA-SEQUENCE:0 #EXT-X-ALLOW-CACHE:NO #EXT-X-VERSION:2 #EXT-X-TARGETDURATION:8 #EXTINF:8, 2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4Frag1Num0.ts #EXTINF:8, 2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4Frag1Num1.ts #EXTINF:8, 2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4Frag2Num2.ts #EXTINF:8,</pre> </div> <p><i>Source: Packet capture by Fiddler tool</i></p>
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**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

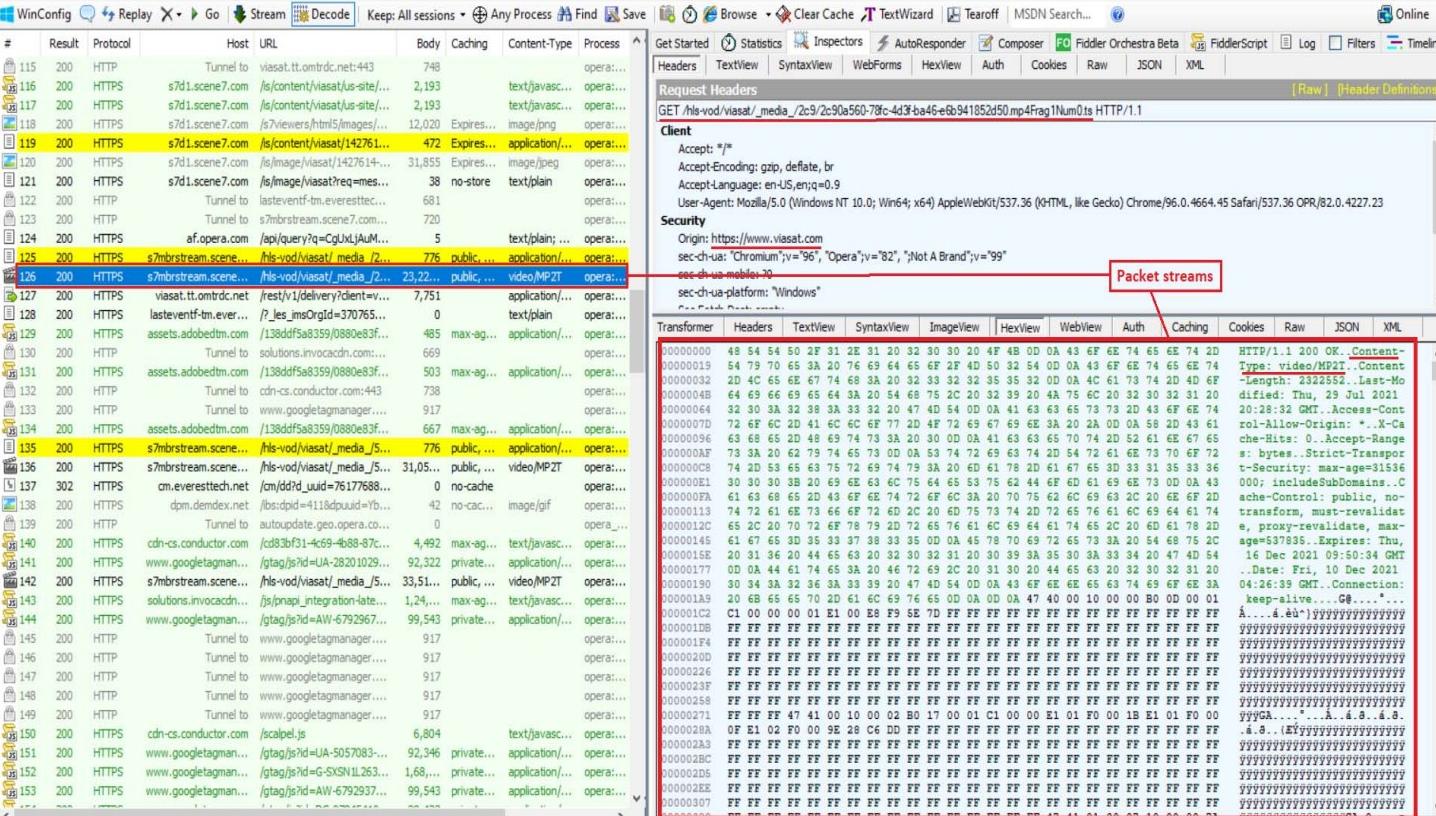
7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
	<p>As shown below, a server of an HLS streaming service provider converts plurality of data streams such as audio, video, etc. of a streaming content (e.g., specific content) such as an ondemand service video in multiple versions in different adaptation sets of a M3U8 Manifest File. For example, an adaption set may consist of representation of different resolutions 1920x1080 video, 426x240 video, etc.</p> <div style="background-color: #f2f2f2; padding: 10px;"> <p><b>Request Headers</b> <span style="float: right;">[Raw] [Header De]</span></p> <pre>GET /s/content/viasat/1427614-%20Shield%20Premium%20with%20Antivirus%20GTM_final_v1-AVS.m3u8 HTTP/1.1</pre> <p><b>Client</b></p> <pre>Accept: */* Accept-Encoding: gzip, deflate, br Accept-Language: en-US,en;q=0.9 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.45 Safari/537.36 OPR/82.0.4227.23</pre> <p><b>Security</b></p> <pre>Origin: https://www.viasat.com sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99" sec-ch-ua-mobile: ?0 sec-ch-ua-platform: "Windows" Sec-Fetch-Dest: empty Sec-Fetch-Mode: cors</pre> <p><i>Source: Packet capture by Fiddler tool</i></p> </div>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

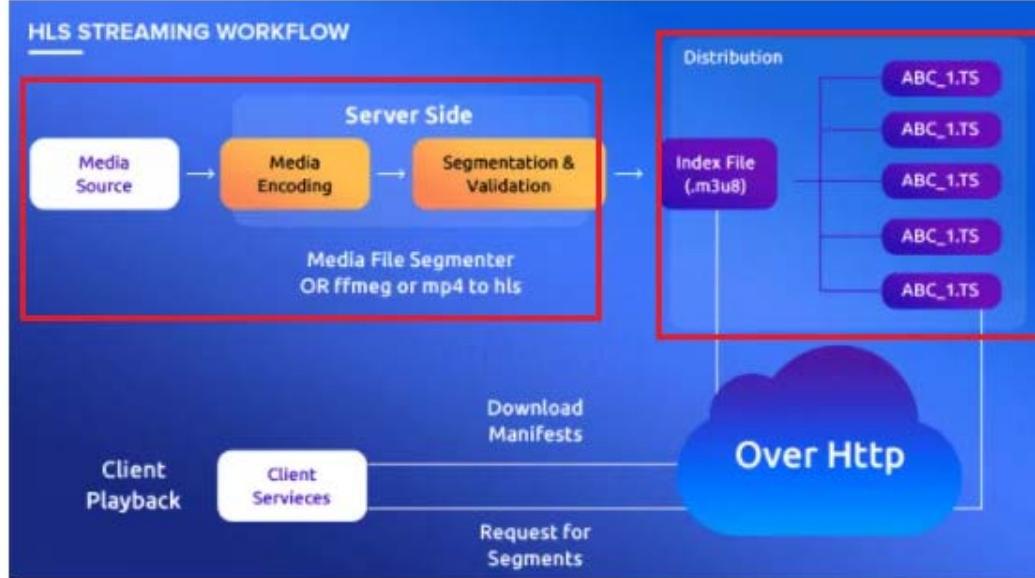
7,848,328	ViaSat (“Accused Instrumentality”)
	 <p>The screenshot shows a packet capture from the Fiddler tool. The main pane displays a list of network requests and responses. A specific request for <code>hls-vod/viasat/_media_1...</code> is highlighted with a red box and labeled "Multiple version of the spec content being streamed". The Fiddler interface includes various tabs like Headers, TextView, SyntaxView, etc., and a detailed view of the selected request's headers and content.</p>

Source: Packet capture by Fiddler tool

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
 <p>Source: Packet capture by Fiddler tool</p>	

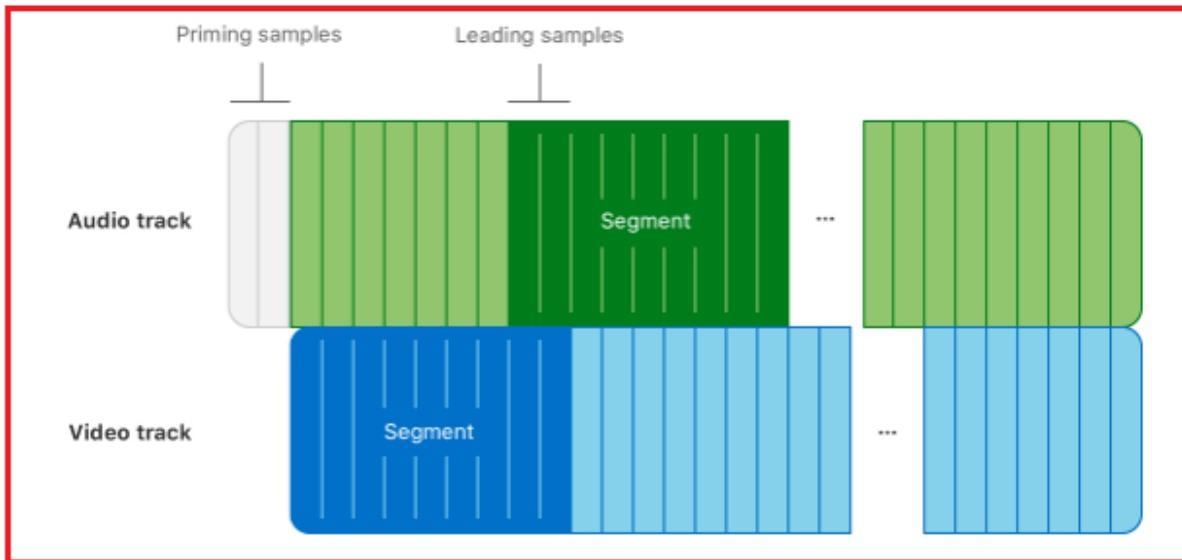
**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

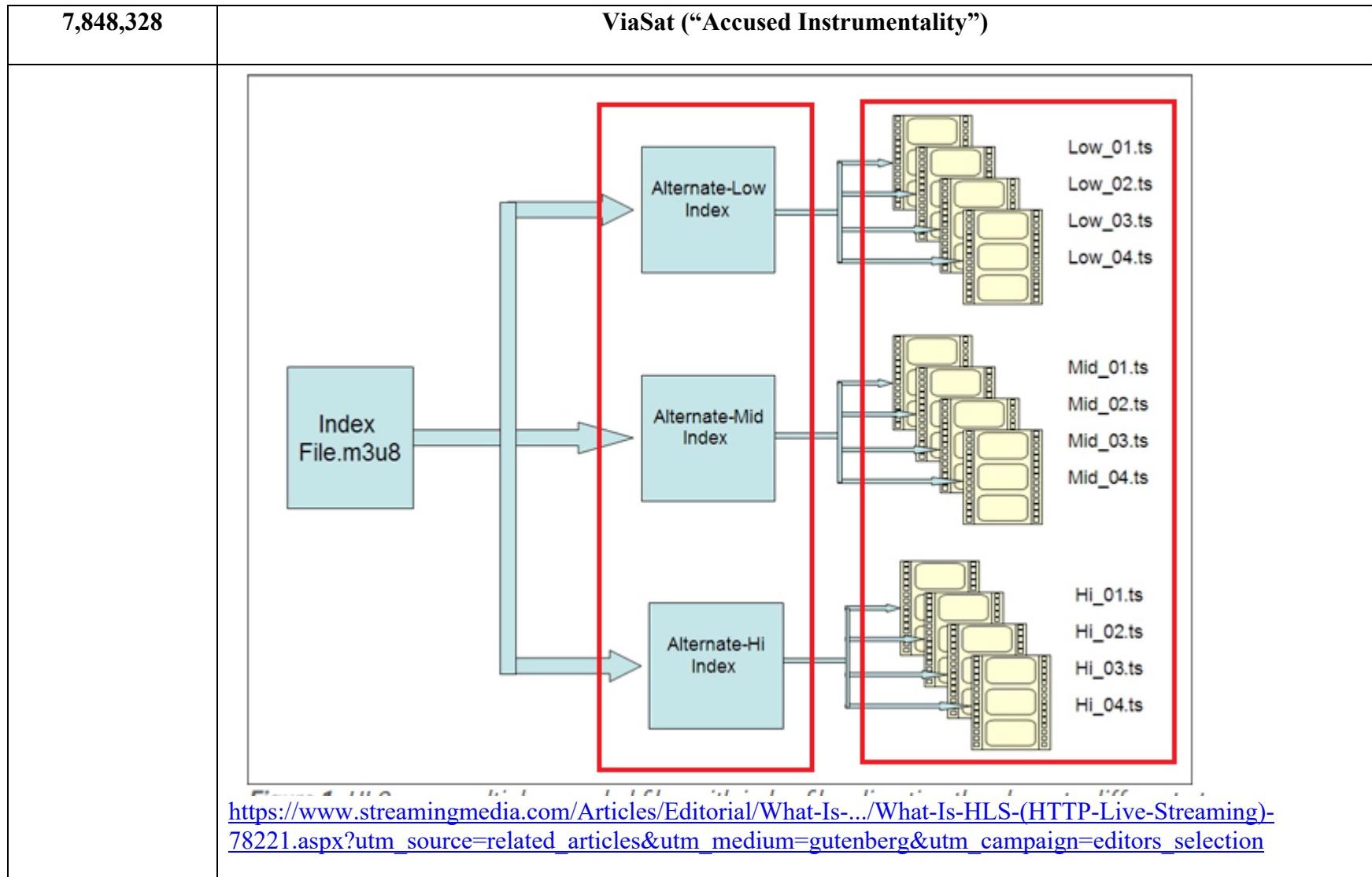
7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p>  <p>The diagram illustrates the HLS Streaming Workflow. On the Server Side, Media Source feeds into Media Encoding, which then leads to Segmentation &amp; Validation. This process is labeled "Media File Segmenter OR ffmpeg or mp4 to hls". The output is an Index File (.m3u8) and a series of TS segments (ABC_1.TS). These are distributed over HTTP. On the Client Side, Client Playback interacts with Client Services, which download manifests and request segments from the distribution point.</p> <p><a href="https://martech.zone/http-live-streaming-player-features/">https://martech.zone/http-live-streaming-player-features/</a></p>
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**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
	<p>HLS supports the following:</p> <ul style="list-style-type: none"> <li>• Live broadcasts and prerecorded content (<u>video on demand, or VOD</u>)</li> <li>• <u>Multiple alternate streams at different bit rates</u></li> <li>• Intelligent switching of streams in response to network bandwidth changes</li> <li>• <u>Media encryption and user authentication</u></li> </ul> <p>The following figure shows the components of an HTTP Live Stream.</p> <pre> graph LR     AV[AV Inputs] --&gt; MediaEncoder[Media encoder]     MediaEncoder --&gt; fMP4[fMP4 file]     fMP4 --&gt; StreamSegmenter[Stream segmenter]     StreamSegmenter --&gt; IndexFile[Origin web server &lt;br/&gt; Index file]     IndexFile --&gt; MP4Files[.mp4]     MP4Files --&gt; Cloud[HTTP]     Cloud --&gt; Client[Client]   </pre> <p>The diagram illustrates the architecture of an HTTP Live Stream. It starts with 'AV Inputs' (represented by a microphone and camera icon) which feed into a 'Server' block. Inside the 'Server' block, a 'Media encoder' converts inputs into an 'fMP4 file', which is then processed by a 'Stream segmenter' to produce individual segments. These segments are sent to a 'Distribution' block. The 'Distribution' block contains an 'Origin web server' that generates an 'Index file' pointing to the '.mp4' files. These files are then delivered via an 'HTTP' cloud to a 'Client' block, which represents a network of devices (laptop, smartphone, tablet).</p> <p><a href="https://developer.apple.com/documentation/http_live_streaming">https://developer.apple.com/documentation/http_live_streaming</a></p>

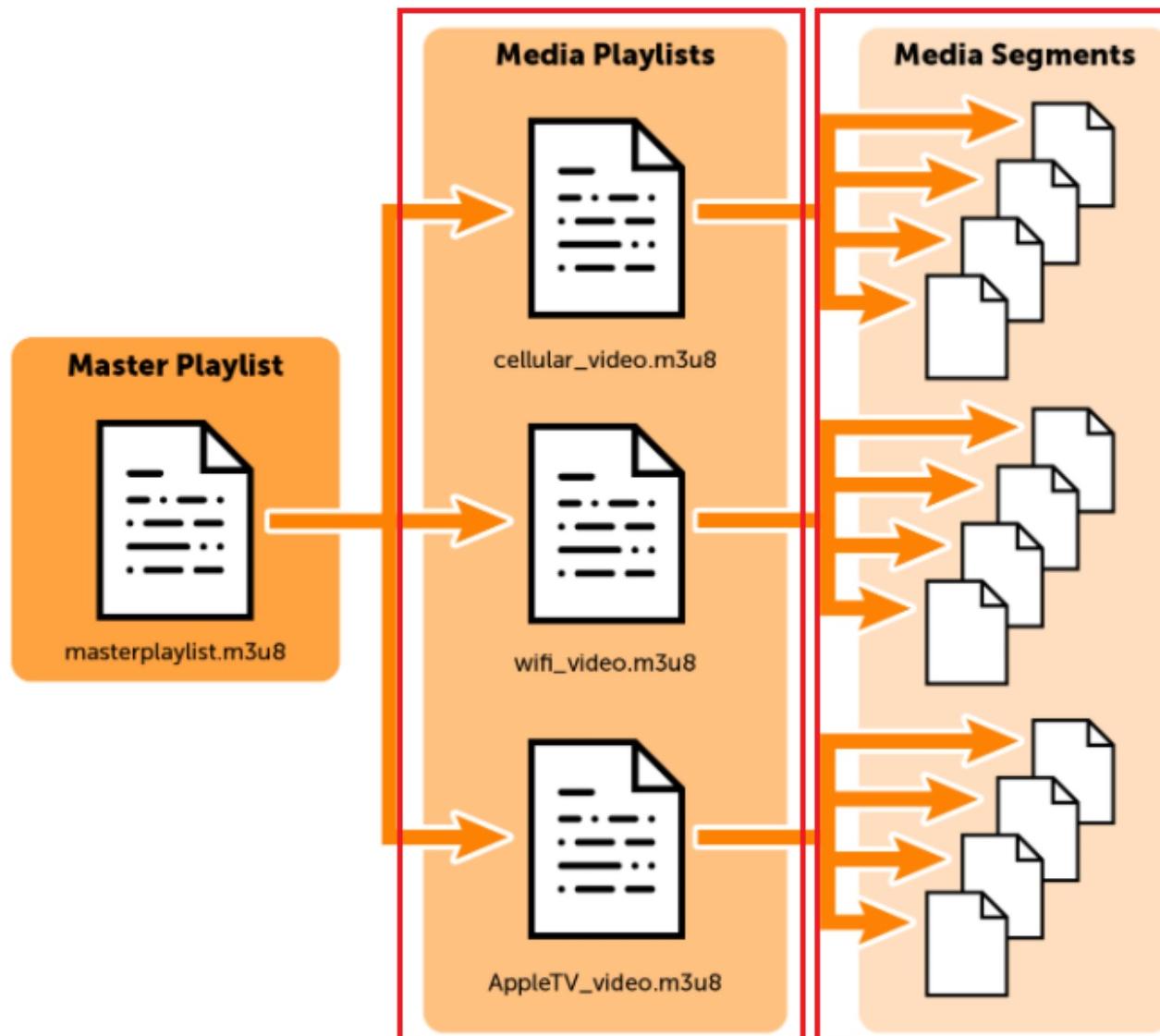
**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
	<p>AAC audio processing requires a small amount of leading “throw-away” audio to prime the encoder and initialize internal tables. This small amount of audio results from <i>encoder delay</i> which happens during encoding to produce properly formed, encoded audio packets, and its duration is commonly referred to as the <i>priming duration</i>. This audio needs to occur before the first frame of video; otherwise, there will be no audio for the first few frames of video.</p>  <p>The audio sample rates are normally 44.1 kHz or 48 kHz. For more information, see the <a href="#">HTTP Live Streaming Specification</a> and the <a href="#">HLS Authoring Specification for Apple Devices</a>.</p> <p><a href="https://developer.apple.com/documentation/http_live_streaming/preparing_audio_for_http_live_streaming">https://developer.apple.com/documentation/http_live_streaming/preparing_audio_for_http_live_streaming</a></p>

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<https://www.wowza.com/blog/hls-streaming-protocol>

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7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <hr/> <p><b><u>1. Introduction to HTTP Live Streaming</u></b></p> <p>HTTP Live Streaming provides a reliable, cost-effective means of <u>delivering continuous and long-form video over the Internet</u>. It allows a receiver to adapt the bit rate of the media to the current network conditions in order to maintain uninterrupted playback at the best possible quality. It supports interstitial content boundaries. It provides a flexible framework for media encryption. It can efficiently <u>offer multiple renditions of the same content, such as audio translations</u>. It offers compatibility with large-scale HTTP caching infrastructure to support delivery to large audiences.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216#section-1">https://datatracker.ietf.org/doc/html/rfc8216#section-1</a></p> <p><b><u>2. Overview</u></b></p> <p>A <u>multimedia presentation is specified by a Uniform Resource Identifier (URI) [RFC3986]</u> to a Playlist.</p> <p>A <u>Playlist is either a Media Playlist or a Master Playlist</u>. Both are <u>UTF-8 text files containing URIs and descriptive tags</u>.</p> <p>A <u>Media Playlist contains a list of Media Segments</u>, which, when played sequentially, will play the multimedia presentation.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>
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7,848,328	ViaSat (“Accused Instrumentality”)
	<pre>#EXTM3U #EXT-X-TARGETDURATION:10  #EXTINF:9.009, http://media.example.com/first.ts #EXTINF:9.009, http://media.example.com/second.ts #EXTINF:3.003, http://media.example.com/third.ts</pre> <p>The first line is the format identifier tag #EXTM3U. The line containing #EXT-X-TARGETDURATION says that all Media Segments will be 10 seconds long or less. Then, three Media Segments are declared. The first and second are 9.009 seconds long; the third is 3.003 seconds.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <p>A more complex presentation can be described by a Master Playlist. A <u>Master Playlist provides a set of Variant Streams, each of which describes a different version of the same content.</u></p> <p><u>A Variant Stream includes a Media Playlist that specifies media encoded at a particular bit rate, in a particular format, and at a particular resolution for media containing video.</u></p> <p><u>A Variant Stream can also specify a set of Renditions. Renditions are alternate versions of the content, such as audio produced in different languages or video recorded from different camera angles.</u></p> <p>Clients should switch between different Variant Streams to adapt to network conditions. Clients should choose Renditions based on user preferences.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>
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**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	<p><b><u>Media Segments</u></b></p> <p>A Media Playlist contains a series of Media Segments that make up the overall presentation. A Media Segment is specified by a URI and optionally a byte range.</p> <p>The duration of each Media Segment is indicated in the Media Playlist by its EXTINF tag (<a href="#">Section 4.3.2.1</a>).</p> <p>Each segment in a Media Playlist has a unique integer Media Sequence Number. The Media Sequence Number of the first segment in the Media Playlist is either 0 or declared in the Playlist (<a href="#">Section 4.3.3.2</a>). The Media Sequence Number of every other segment is equal to the Media Sequence Number of the segment that precedes it plus one.</p> <p>Each Media Segment MUST carry the continuation of the encoded bitstream from the end of the segment with the previous Media Sequence Number, where values in a series such as timestamps and Continuity Counters MUST continue uninterrupted. The only exceptions are the first Media Segment ever to appear in a Media Playlist and Media Segments that are explicitly signaled as discontinuities (<a href="#">Section 4.3.2.3</a>). Unmarked media discontinuities can trigger playback errors.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	<p><b><u>3.2. MPEG-2 Transport Streams</u></b></p> <p>MPEG-2 Transport Streams are specified by [<a href="#">ISO 13818</a>].</p> <p><u>The Media Initialization Section of an MPEG-2 Transport Stream Segment is a Program Association Table (PAT) followed by a Program Map Table (PMT).</u></p> <p><u>Transport Stream Segments MUST contain a single MPEG-2 Program; playback of Multi-Program Transport Streams is not defined. Each Transport Stream Segment MUST contain a PAT and a PMT, or have an EXT-X-MAP tag (<a href="#">Section 4.3.2.5</a>) applied to it. The first two Transport Stream packets in a Segment without an EXT-X-MAP tag SHOULD be a PAT and a PMT.</u></p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>

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	<p><b><u>3.4. Packed Audio</u></b></p> <p>A <u>Packed Audio Segment</u> contains encoded audio samples and ID3 tags that are simply packed together with minimal framing and no per-sample timestamps. <u>Supported Packed Audio formats are Advanced Audio Coding (AAC) with Audio Data Transport Stream (ADTS) framing</u> [<u>ISO 13818_7</u>], <u>MP3</u> [<u>ISO 13818_3</u>], <u>AC-3</u> [<u>AC_3</u>], and <u>Enhanced AC-3</u> [<u>AC_3</u>].</p> <p>A Packed Audio Segment has no Media Initialization Section.</p> <p>Each <u>Packed Audio Segment</u> MUST signal the timestamp of its first sample with <u>an ID3 Private frame (PRIV) tag</u> [<u>ID3</u>] at the beginning of the segment. The ID3 PRIV owner identifier MUST be "com.apple.streaming.transportStreamTimestamp". <u>The ID3 payload MUST be a 33-bit MPEG-2 Program Elementary Stream timestamp expressed as a big-endian eight-octet number, with the upper 31 bits set to zero.</u> Clients SHOULD NOT play Packed Audio Segments without this ID3 tag.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>

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7,848,328	ViaSat (“Accused Instrumentality”)
	<p><b><u>3.5. WebVTT</u></b></p> <p>A WebVTT Segment is a section of a WebVTT [<a href="#">WebVTT</a>] file. <u>WebVTT Segments carry subtitles.</u></p> <p>The Media Initialization Section of a WebVTT Segment is the WebVTT header.</p> <p><u>Each WebVTT Segment MUST contain all subtitle cues that are intended to be displayed during the period indicated by the segment EXTINF duration.</u> The start time offset and end time offset of each cue MUST indicate the total display time for that cue, even if part of the cue <u>time range is outside the Segment period.</u> A WebVTT Segment MAY contain no cues; this indicates that no subtitles are to be displayed during that period.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>

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7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <p>In order to <u>synchronize</u> timestamps between audio/video and subtitles, an <u>X-TIMESTAMP-MAP</u> metadata header SHOULD be added to each WebVTT header. <u>This header maps WebVTT cue timestamps to MPEG-2 (PES) timestamps in other Renditions of the Variant Stream.</u> Its format is:</p> <p>X-TIMESTAMP-MAP=LOCAL:&lt;cue time&gt;,MPEGTS:&lt;MPEG-2 time&gt; e.g., X-TIMESTAMP-MAP=LOCAL:00:00:00.000,MPEGTS:900000</p> <p>The cue timestamp in the LOCAL attribute MAY fall outside the range of time covered by the segment.</p> <p>If a WebVTT segment does not have the X-TIMESTAMP-MAP, the client MUST assume that the WebVTT cue time of 0 maps to an MPEG-2 timestamp of 0.</p> <p>When synchronizing WebVTT with PES timestamps, clients SHOULD account for cases where the 33-bit PES timestamps have wrapped and the WebVTT cue times have not.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>
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**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <p><b><u>4.3.2. Media Segment Tags</u></b></p> <p>Each Media Segment is <u>specified by a series of Media Segment tags followed by a URI</u>. Some Media Segment tags apply to just the next segment; others apply to all subsequent segments until another instance of the same tag.</p> <p>A Media Segment tag MUST NOT appear in a Master Playlist. Clients MUST fail to parse Playlists that contain both Media Segment tags and Master Playlist tags (<a href="#">Section 4.3.4</a>).</p> <p><b><u>4.3.2.1. EXTINF</u></b></p> <p>The EXTINF tag specifies the duration of a Media Segment. It applies <u>only to the next Media Segment</u>. This tag is REQUIRED for each Media Segment. Its format is:</p> <p style="margin-left: 40px;"><u>#EXTINF:&lt;duration&gt;,[&lt;title&gt;]</u></p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>
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**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <p><b><u>4.3.2.7. EXT-X-DATERANGE</u></b></p> <p>The <u>EXT-X-DATERANGE tag associates a Date Range (i.e., a range of time defined by a starting and ending date) with a set of attribute/value pairs.</u> Its format is:</p> <pre>#EXT-X-DATERANGE:&lt;attribute-list&gt;</pre> <p>where the defined attributes are:</p> <p><u>ID</u></p> <p>A quoted-string that uniquely identifies a Date Range in the Playlist. This attribute is REQUIRED.</p> <p><u>CLASS</u></p> <p>A client-defined quoted-string that specifies some set of attributes and their associated value semantics. All Date Ranges with the same CLASS attribute value MUST adhere to these semantics. This attribute is OPTIONAL.</p> <p><u>START-DATE</u></p> <p>A quoted-string containing the ISO-8601 date at which the Date Range begins. This attribute is REQUIRED.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>
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## **NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

### **4.3.4. Master Playlist Tags**

Master Playlist tags define the Variant Streams, Renditions, and other global parameters of the presentation.

Master Playlist tags MUST NOT appear in a Media Playlist; clients MUST fail to parse any Playlist that contains both a Master Playlist tag and either a Media Playlist tag or a Media Segment tag.

#### **4.3.4.1. EXT-X-MEDIA**

The EXT-X-MEDIA tag is used to relate Media Playlists that contain alternative Renditions ([Section 4.3.4.2.1](#)) of the same content. For example, three EXT-X-MEDIA tags can be used to identify audio-only Media Playlists that contain English, French, and Spanish Renditions of the same presentation. Or, two EXT-X-MEDIA tags can be used to identify video-only Media Playlists that show two different camera angles.

Its format is:

```
#EXT-X-MEDIA:<attribute-list>
```

The following attributes are defined:

##### TYPE

The value is an enumerated-string; valid strings are AUDIO, VIDEO, SUBTITLES, and CLOSED-CAPTIONS. This attribute is REQUIRED.

<https://datatracker.ietf.org/doc/html/rfc8216>

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7,848,328	ViaSat (“Accused Instrumentality”)

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*Preliminary charts based on best available information*

**AUDIO**

The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is AUDIO. It indicates the set of audio Renditions that SHOULD be used when playing the presentation. See [Section 4.3.4.2.1](#).

The AUDIO attribute is OPTIONAL.

**VIDEO**

The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is VIDEO. It indicates the set of video Renditions that SHOULD be used when playing the presentation. See [Section 4.3.4.2.1](#).

The VIDEO attribute is OPTIONAL.

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HTTP Live Streaming

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**SUBTITLES**

The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is SUBTITLES. It indicates the set of subtitle Renditions that can be used when playing the presentation. See [Section 4.3.4.2.1](#).

The SUBTITLES attribute is OPTIONAL.

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	<a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

**4.3.5. Media or Master Playlist Tags**

The tags in this section can appear in either Master Playlists or Media Playlists. If one of these tags appears in a Master Playlist, it SHOULD NOT appear in any Media Playlist referenced by that Master Playlist. A tag that appears in both MUST have the same value; otherwise, clients SHOULD ignore the value in the Media Playlist(s).

These tags MUST NOT appear more than once in a Playlist. If a tag appears more than once, clients MUST fail to parse the Playlist.

**4.3.5.1. EXT-X-INDEPENDENT-SEGMENTS**

The EXT-X-INDEPENDENT-SEGMENTS tag indicates that all media samples in a Media Segment can be decoded without information from other segments. It applies to every Media Segment in the Playlist.

Its format is:

#EXT-X-INDEPENDENT-SEGMENTS

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Informational

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RFC 8216

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If the EXT-X-INDEPENDENT-SEGMENTS tag appears in a Master Playlist, it applies to every Media Segment in every Media Playlist in the Master Playlist.

<https://datatracker.ietf.org/doc/html/rfc8216>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>	
<p><b><u>6.2.1. General Server Responsibilities</u></b></p> <p>The production of the source media is outside the scope of this document, which simply presumes a source of continuous encoded media containing the presentation.</p> <p><u>The server MUST divide the source media into individual Media Segments whose duration is less than or equal to a constant target duration.</u> Segments that are longer than the planned target duration can trigger playback stalls and other errors.</p>		
Pantos & May	Informational	[Page 37]
<u>RFC 8216</u>	HTTP Live Streaming	August 2017
<p>The server SHOULD attempt to divide the source media at points that support effective decode of individual Media Segments, e.g., on packet and key frame boundaries.</p> <p>The server MUST create a URI for every Media Segment that enables its clients to obtain the segment data. If a server supports partial loading of resources (e.g., via HTTP Range requests), it MAY specify segments as sub-ranges of larger resources using the EXT-X-BYTERANGE tag.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>		

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <p><b><u>6.2.4. Providing Variant Streams</u></b></p> <p>A server MAY offer multiple Media Playlist files to provide different encodings of the same presentation. If it does so, it SHOULD provide a Master Playlist file that lists each Variant Stream to allow clients to switch between encodings dynamically.</p> <p>Master Playlists describe regular Variant Streams with EXT-X-STREAM-INF tags and I-frame Variant Streams with EXT-X-I-FRAME-STREAM-INF tags.</p> <p>If an EXT-X-STREAM-INF tag or EXT-X-I-FRAME-STREAM-INF tag contains the CODECS attribute, the attribute value MUST include every media format [RFC6381] present in any Media Segment in any of the Renditions specified by the Variant Stream.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>
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**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
	<p>The server <b>MUST</b> meet the following constraints when producing Variant Streams in order to allow clients to switch between them seamlessly:</p> <ul style="list-style-type: none"> <li>o Each Variant Stream <b>MUST</b> present the same content.</li> <li>o <b>Matching content in Variant Streams MUST have matching timestamps.</b> This allows clients to synchronize the media.</li> <li>o <b>Matching content in Variant Streams MUST have matching Discontinuity Sequence Numbers</b> (see <a href="#">Section 4.3.3.3</a>).</li> <li>o Each Media Playlist in each Variant Stream <b>MUST</b> have the same target duration. The only exceptions are SUBTITLES Renditions and Media Playlists containing an EXT-X-I-FRAMES-ONLY tag, which <b>MAY</b> have different target durations if they have an EXT-X-PLAYLIST-TYPE of VOD.</li> </ul> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p> <p><b><u>8.7. Master Playlist with Alternative Video</u></b></p> <p>This example shows <b>three different video Renditions</b> (Main, Centerfield, and Dugout) and <b>three different Variant Streams</b> (low, mid, and high). In this example, clients that did not support the EXT-X-MEDIA tag and the VIDEO attribute of the EXT-X-STREAM-INF tag would only be able to play the video Rendition "Main".</p> <p>Since the EXT-X-STREAM-INF tag has no AUDIO attribute, all video Renditions would be required to contain the audio.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>

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In this example, the CODECS attributes have been condensed for space  
A '\' is used to indicate that the tag continues on the following  
line with whitespace removed:

```
#EXTM3U
#EXT-X-MEDIA:TYPE=VIDEO, GROUP-ID="low", NAME="Main", \
    DEFAULT=YES, URI="low/main/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO, GROUP-ID="low", NAME="Centerfield", \
    DEFAULT=NO, URI="low/centerfield/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO, GROUP-ID="low", NAME="Dugout", \
    DEFAULT=NO, URI="low/dugout/audio-video.m3u8"

#EXT-X-STREAM-INF: BANDWIDTH=1280000, CODECS="...", VIDEO="low"
low/main/audio-video.m3u8

#EXT-X-MEDIA:TYPE=VIDEO, GROUP-ID="mid", NAME="Main", \
    DEFAULT=YES, URI="mid/main/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO, GROUP-ID="mid", NAME="Centerfield", \
    DEFAULT=NO, URI="mid/centerfield/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO, GROUP-ID="mid", NAME="Dugout", \
    DEFAULT=NO, URI="mid/dugout/audio-video.m3u8"

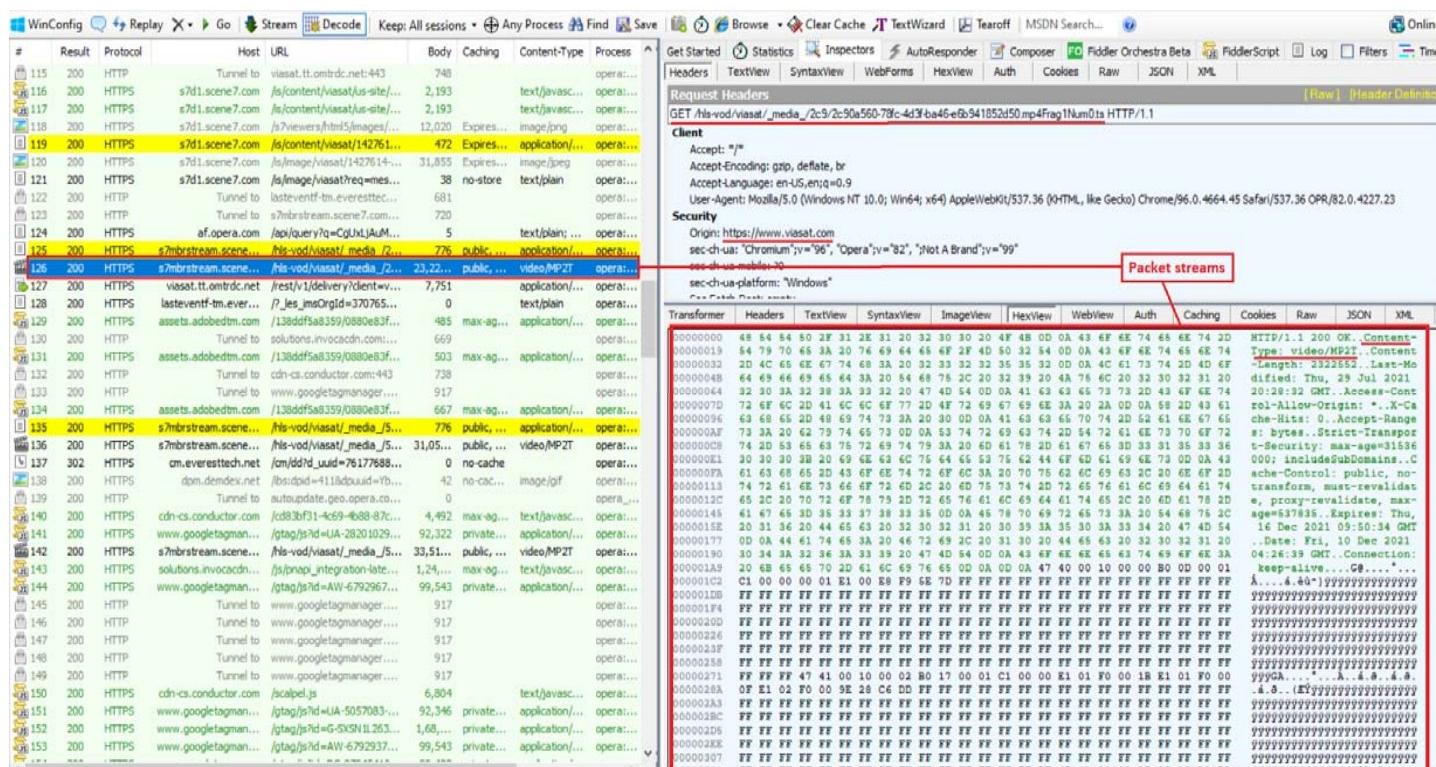
#EXT-X-STREAM-INF: BANDWIDTH=2560000, CODECS="...", VIDEO="mid"
mid/main/audio-video.m3u8

#EXT-X-MEDIA:TYPE=VIDEO, GROUP-ID="hi", NAME="Main", \
    DEFAULT=YES, URI="hi/main/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO, GROUP-ID="hi", NAME="Centerfield", \
    DEFAULT=NO, URI="hi/centerfield/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO, GROUP-ID="hi", NAME="Dugout", \
    DEFAULT=NO, URI="hi/dugout/audio-video.m3u8"

#EXT-X-STREAM-INF: BANDWIDTH=7680000, CODECS="...", VIDEO="hi"
hi/main/audio-video.m3u8
```

<https://datatracker.ietf.org/doc/html/rfc8216>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
encapsulating each data stream of the plurality into a stream of packets according to a first communication protocol,	<p>The accused standard discloses encapsulating each data stream (e.g., media streams such as audio, video, captions, etc.) of the plurality into a stream of packets (e.g., index file m3u8 data packets) according to a first communication protocol (e.g., Transmission control protocol).</p> <p>As shown below, For HLS, MPEG-2 transport stream is used to encapsulate the data stream (e.g., media streams such as audio, video, captions, etc.) using first communication protocol (e.g. TCP).</p> 

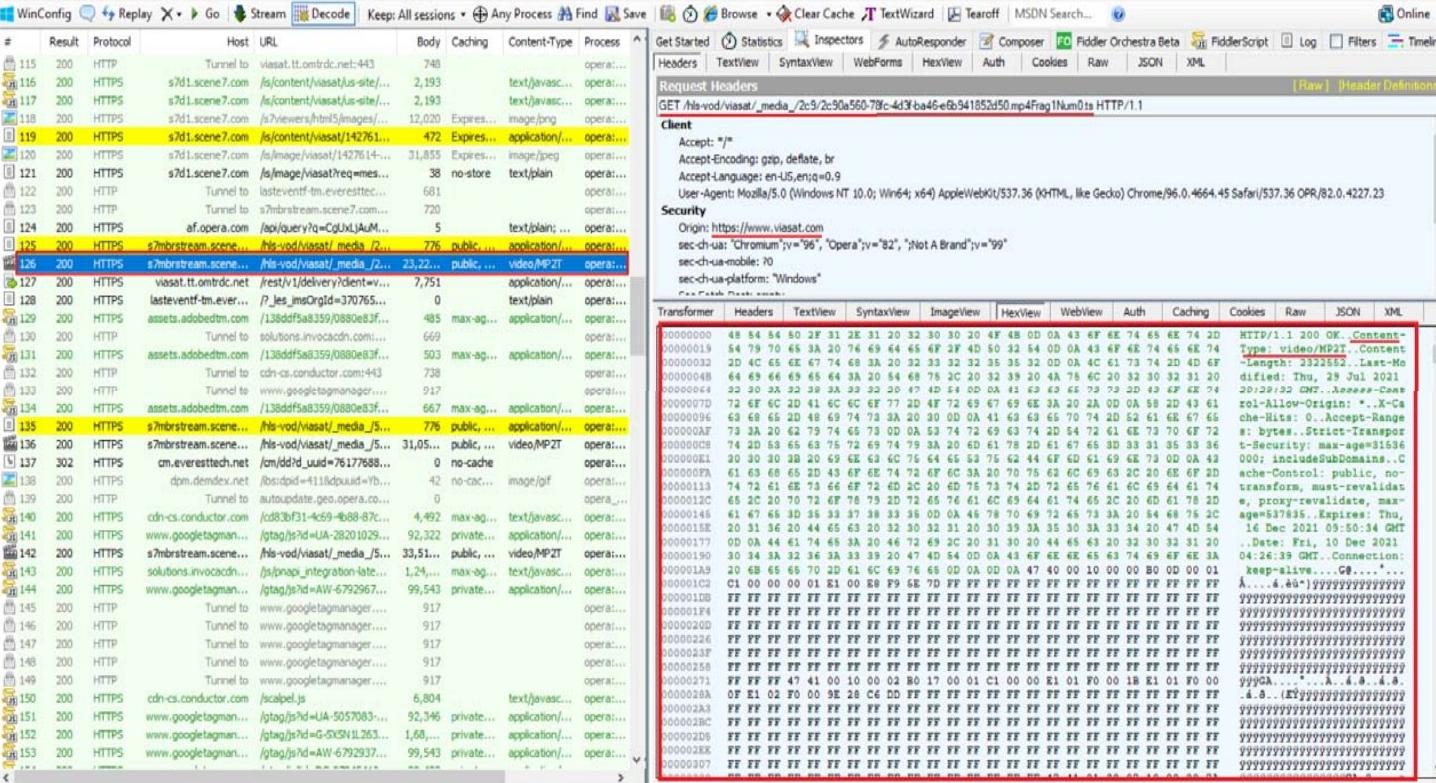
**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

<b>7,848,328</b>	<b>ViaSat (“Accused Instrumentality”)</b>
<i>Source: Packet capture by Fiddler tool</i>	
<p>The screenshot displays a list of network traffic captured by Fiddler. Key entries include:</p> <ul style="list-style-type: none"> <li>Request Headers for a video stream: GET /hls-vod/viasat/_media/_2c9/2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4Frag1Num0.ts HTTP/1.1</li> <li>Security details: Origin: https://www.viasat.com, sec-ch-ua: "Chromium";v="96", "Opera";v="82", "Not A Brand";v="99", sec-ch-ua-mobile: ?0, sec-ch-ua-platform: "Windows"</li> <li>Transport settings: Connection: keep-alive, Host: s7mbrstream.scene7.com</li> <li>Response Headers: HTTP/1.1 200 OK</li> <li>Cache headers: Cache-Control: public, no-transform, must-revalidate, proxy-revalidate, max-age=537835, Date: Fri, 10 Dec 2021 04:26:39 GMT, Expires: Thu, 16 Dec 2021 09:50:34 GMT, X-Cache-Hits: 0</li> <li>Entity headers: Content-Length: 2322552, Content-Type: video/MP2T, Last-Modified: Thu, 29 Jul 2021 20:28:32 GMT</li> <li>Miscellaneous: Accept-Ranges: bytes</li> <li>Security headers: Access-Control-Allow-Origin: *, Strict-Transport-Security: max-age=31536000; includeSubDomains</li> <li>Transport: Connection: keep-alive</li> </ul>	

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #cccccc; width: 100px; padding: 2px;"><b>Request Headers</b></td><td style="padding: 2px; text-align: right;">[ Raw ] [ Header De</td></tr> <tr> <td colspan="2" style="padding: 2px;">GET /s/content/viasat/1427614-%20Shield%20Premium%20with%20Antivirus%20GTM_final_v1-AVS.m3u8 HTTP/1.1</td></tr> <tr> <td colspan="2" style="padding: 2px;"> <b>Client</b>            Accept: */*            Accept-Encoding: gzip, deflate, br            Accept-Language: en-US,en;q=0.9            User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.45 Safari/537.36 OPR/82.0.4227.23         </td></tr> <tr> <td colspan="2" style="padding: 2px;"> <b>Security</b>            Origin: https://www.viasat.com            sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99"            sec-ch-ua-mobile: ?0            sec-ch-ua-platform: "Windows"            Sec-Fetch-Dest: empty            Sec-Fetch-Mode: cors         </td></tr> </table> <p style="margin-top: 10px;"><i>Source: Packet capture by Fiddler tool</i></p>	<b>Request Headers</b>	[ Raw ] [ Header De	GET /s/content/viasat/1427614-%20Shield%20Premium%20with%20Antivirus%20GTM_final_v1-AVS.m3u8 HTTP/1.1		<b>Client</b> Accept: */* Accept-Encoding: gzip, deflate, br Accept-Language: en-US,en;q=0.9 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.45 Safari/537.36 OPR/82.0.4227.23		<b>Security</b> Origin: https://www.viasat.com sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99" sec-ch-ua-mobile: ?0 sec-ch-ua-platform: "Windows" Sec-Fetch-Dest: empty Sec-Fetch-Mode: cors	
<b>Request Headers</b>	[ Raw ] [ Header De								
GET /s/content/viasat/1427614-%20Shield%20Premium%20with%20Antivirus%20GTM_final_v1-AVS.m3u8 HTTP/1.1									
<b>Client</b> Accept: */* Accept-Encoding: gzip, deflate, br Accept-Language: en-US,en;q=0.9 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.45 Safari/537.36 OPR/82.0.4227.23									
<b>Security</b> Origin: https://www.viasat.com sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99" sec-ch-ua-mobile: ?0 sec-ch-ua-platform: "Windows" Sec-Fetch-Dest: empty Sec-Fetch-Mode: cors									

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7,848,328	ViaSat (“Accused Instrumentality”)
 <p>Source: Packet capture by Fiddler tool</p>	

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <h2 style="margin-top: 20px; border-bottom: 2px solid red; padding-bottom: 5px;"><b>Encode MPEG-2 Transport Stream Segments</b></h2> <p>MPEG-2 transport streams create an arbitrary timestamp when encoding media, using an 33-bit clock that rolls over every 26 hours. For example, if your video starts at the two-hour mark, your audio starts at two hours plus the time for the leading audio. Therefore, a segment of audio that's paired with a segment of video starting at the two-hour mark needs audio that starts at the two-hour mark minus the priming duration. This additional segment ensures the first frame of video plays synchronously with the audio.</p> <h2 style="margin-top: 20px; border-bottom: 2px solid red; padding-bottom: 5px;"><b>Encode Fragmented MPEG-4 Segments</b></h2> <p>The MPEG-4 file format (ISO BMFF) carries the presumption that all track timelines begin with time zero, regardless of whether the timeline is divided into fragments. However, you can set the initial decode time of any fragment to an arbitrary value by means of the Track Fragment Base Media Decode Time Box (tfdt). Use this box to permit the alignment of the audio timeline with the video timeline that places the priming audio prior to the first video frame.</p> <p>Alternatively, starting with iOS 13.1 it's possible to utilize an Edit List Box (elst) within the Track Box (trak) in order to place the duration of the priming audio prior to time 0. This permits a natural alignment of other tracks with audio at time 0. The edit list needs to have a single entry in which the value of media_start is equivalent to the audio priming duration and the value of segment_duration is 0. This is the recommended approach for time alignment for the Common Media Application Format (CMAF).</p>
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*Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <p><a href="https://developer.apple.com/documentation/http_live_streaming/preparing_audio_for_http_live_streaming">https://developer.apple.com/documentation/http_live_streaming/preparing_audio_for_http_live_streaming</a></p> <div style="border: 2px solid red; padding: 10px; margin-top: 10px;"><h2 style="margin: 0;">Does HLS use TCP or UDP as its transport protocol?</h2></div> <p>TCP and UDP are transport protocols, meaning they are responsible for delivering content over the Internet. TCP tends to deliver data more reliably than UDP, but the latter is much faster, even though some data may be lost in transit.</p> <p>Because UDP is faster, some streaming protocols use UDP instead of TCP. HLS, however, <u>uses TCP</u>. This is for several reasons:</p> <ol style="list-style-type: none"><li>1. HLS is over HTTP, and the HTTP protocol is built for use with TCP <u>(with some exceptions)</u>.</li><li>2. The modern Internet is more reliable and more efficient than it was when streaming was first developed. In many parts of the world today, user connectivity has vastly improved, especially for mobile connections. As a result, users have enough bandwidth to support the delivery of every video frame.</li><li>3. Adaptive bitrate streaming helps compensate for the potentially slower data delivery of TCP.</li></ol> <p><a href="https://www.cloudflare.com/learning/video/what-is-http-live-streaming/">https://www.cloudflare.com/learning/video/what-is-http-live-streaming/</a></p>
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7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
	<p>A URI in a Playlist, whether it is a URI line or part of a tag, MAY be relative. Any relative URI is considered to be relative to the URI of the Playlist that contains it.</p> <p>The duration of a Media Playlist is the sum of the durations of the Media Segments within it.</p> <p>The segment bit rate of a Media Segment is the size of the Media Segment divided by its EXTINF duration (<a href="#">Section 4.3.2.1</a>). Note that this includes container overhead but does not include overhead imposed by the <u>delivery system</u>, such as HTTP, TCP, or IP headers.</p> <p>The peak segment bit rate of a Media Playlist is the largest bit rate of any contiguous set of segments whose total duration is between 0.5 and 1.5 times the target duration. The bit rate of a set is calculated by dividing the sum of the segment sizes by the sum of the segment durations.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216#section-1">https://datatracker.ietf.org/doc/html/rfc8216#section-1</a></p>
wherein, as to each of the packet streams, the packets have a value in a common field identifying the component mapped to the data	<p>The accused standard discloses wherein, as to each of the packet streams (e.g., m3u8 data packet stream), the packets have a value (e.g., audio/video type, group id, etc.) in a common field identifying the component mapped to the data stream (e.g., media streams such as audio, video, captions, etc.) encapsulated by the packet stream (e.g., m3u8 data packet stream).</p> <p>As shown below, the common field shows “type: video”</p>

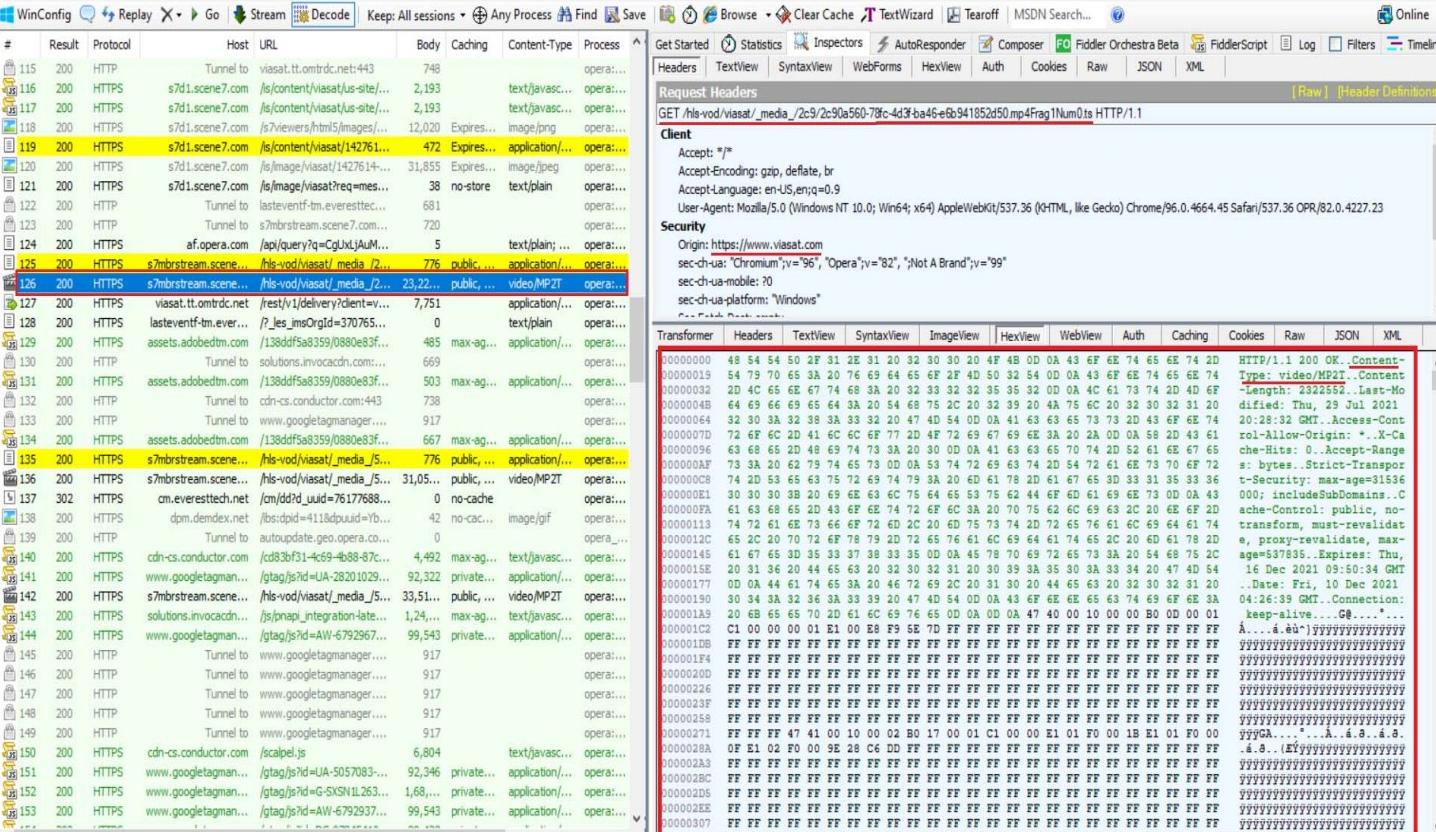
**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

<b>ViaSat (“Accused Instrumentality”)</b>	
7,848,328 stream encapsulated by the packet stream;	<p><b>Request Headers</b> <span style="float: right;">[ Raw ] [Header Defin]</span></p> <pre>GET /hls-vod/viasat/_media/_2c9/2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4Frag1Num0.ts HTTP/1.1</pre> <p><b>Client</b></p> <pre>Accept: */* Accept-Encoding: gzip, deflate, br Accept-Language: en-US,en;q=0.9 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.45 Safari/537.36 OPR/82.0.4227.23</pre> <p><b>Security</b></p> <pre>Origin: https://www.viasat.com sec-ch-ua: "Chromium";v="96", "Opera";v="82", "Not A Brand";v="99" sec-ch-ua-mobile: ? sec-ch-ua-platform: "Windows" Sec-Fetch-Dest: empty Sec-Fetch-Mode: cors</pre> <p style="text-align: center;"><a href="#">Transformer</a>   <a href="#">Headers</a>   <a href="#">Text View</a>   <a href="#">Syntax View</a>   <a href="#">Image View</a>   <a href="#">Hex View</a>   <a href="#">Web View</a>   <a href="#">Auth</a>   <a href="#">Caching</a>   <a href="#">Cookies</a>   <a href="#">Raw</a>   <a href="#">JSON</a>   <a href="#">XML</a></p> <p><b>Response Headers</b> <span style="float: right;">[ Raw ] [Header Defin]</span></p> <pre>HTTP/1.1 200 OK</pre> <p><b>Cache</b></p> <pre>Cache-Control: public, no-transform, must-revalidate, proxy-revalidate, max-age=537835 Date: Fri, 10 Dec 2021 04:26:39 GMT Expires: Thu, 16 Dec 2021 09:50:34 GMT X-Cache-Hits: 0</pre> <p><b>Entity</b></p> <pre>Content-Length: 2322552 Content-Type: video/MP2T Last-Modified: Thu, 29 Jul 2021 20:28:32 GMT</pre> <p><b>Miscellaneous</b></p> <pre>Accept-Ranges: bytes</pre> <p><b>Security</b></p> <pre>Access-Control-Allow-Origin: * Strict-Transport-Security: max-age=31536000; includeSubDomains</pre> <p><b>Transport</b></p> <pre>Connection: keep-alive</pre> <p><i>Source: Packet capture by Fiddler tool</i></p>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <hr/> <div style="background-color: #f2f2f2; padding: 5px;"> <p><b>Request Headers</b> <span style="float: right;">[ Raw ] [ Header Details ]</span></p> <pre>GET /is/content/viasat/1427614-%20Shield%20Premium%20with%20Antivirus%20GTM_final_v1-AVS.m3u8 HTTP/1.1</pre> <p><b>Client</b></p> <pre>Accept: */* Accept-Encoding: gzip, deflate, br Accept-Language: en-US,en;q=0.9 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.45 Safari/537.36 OPR/82.0.4227.23</pre> <p><b>Security</b></p> <pre>Origin: https://www.viasat.com sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99" sec-ch-ua-mobile: ?0 sec-ch-ua-platform: "Windows" Sec-Fetch-Dest: empty Sec-Fetch-Mode: cors</pre> </div> <hr/> <p style="text-align: center;"><i>Source: Packet capture by Fiddler tool</i></p>
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**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328		ViaSat (“Accused Instrumentality”)													
															
#	Result	Protocol	Host	URL	Body	Caching	Content-Type	Process							
115	200	HTTP	Tunnel to	viasat.tt.omtrdc.net:443	748		opera...								
116	200	HTTPS	s7d1.scene7.com	/s/content/viasat/us-site/...	2,193		text/javasc...	opera...							
117	200	HTTPS	s7d1.scene7.com	/s/content/viasat/us-site/...	2,193		text/javasc...	opera...							
118	200	HTTPS	s7d1.scene7.com	/s?viewers/html5/images/...	12,020	Expires...	image/png	opera...							
119	200	HTTPS	s7d1.scene7.com	/s/content/viasat/142761...	472	Expires...	application/...	opera...							
120	200	HTTPS	s7d1.scene7.com	/s/image/viasat/1427614...	31,855	Expires...	image/jpeg	opera...							
121	200	HTTPS	s7d1.scene7.com	/s/image/viasat/?req=mes...	38	no-store	text/plain	opera...							
122	200	HTTP	Tunnel to	lastevenf-tm-everestee...	681		opera...								
123	200	HTTP	Tunnel to	s7mbsstream.scene7.com...	720		opera...								
124	200	HTTPS	af.opera.com	/api/query?q=CgJxLAuM...	5		text/plain;	opera...							
125	200	HTTPS	s7mbsstream.scene.../hs-vod/viasat/_media/...	23,22...	public, ...	video/MP2T	opera...								
126	200	HTTPS	s7mbsstream.scene.../hs-vod/viasat/_media/...	23,22...	public, ...	video/MP2T	opera...								
127	200	HTTPS	viasat.tt.omtrdc.net	/rest/v1/delivery/client+e...	7,751		application/...	opera...							
128	200	HTTP	Tunnel to	lastevenf-tm-everestee...	0		text/plain	opera...							
129	200	HTTPS	assets.adobedtm.com	/138adfsa8359/0880e83f...	485	max-ag...	application/...	opera...							
130	200	HTTP	Tunnel to	solutions.invokecdn.com...	669		opera...								
131	200	HTTPS	assets.adobedtm.com	/138adfsa8359/0880e83f...	503	max-ag...	application/...	opera...							
132	200	HTTP	Tunnel to	cdb.cs.conductor.com:443	738		opera...								
133	200	HTTP	Tunnel to	www.googletagmanager...	917		opera...								
134	200	HTTPS	assets.adobedtm.com	/138adfsa8359/0880e83f...	667	max-ag...	application/...	opera...							
135	200	HTTPS	s7mbsstream.scene.../hs-vod/viasat/_media/...	776	public, ...	application/...	opera...								
136	200	HTTPS	s7mbsstream.scene.../hs-vod/viasat/_media/...	31,05...	public, ...	video/MP2T	opera...								
137	302	HTTPS	cm-everesttech.net	/cm/ddId=uid=7617688...	0	no-cache	opera...								
138	200	HTTPS	dpm.demdex.net	/bsid=pid=118dpuid=yb...	42	no-cac...	image/gif	opera...							
139	200	HTTP	Tunnel to	autoupdate.geo.opera.co...	0		opera...								
140	200	HTTPS	cdn.cs.conductor.com	/cd83f31-4c69-4b88-87c...	4,492	max-ag...	text/javasc...	opera...							
141	200	HTTPS	www.googletagman...	/tag/sid=UA-28201029...	92,322	private...	application/...	opera...							
142	200	HTTPS	s7mbsstream.scene.../hs-vod/viasat/_media/...	33,51...	public, ...	video/MP2T	opera...								
143	200	HTTPS	solutions.invokecdn...	/js/api_integration-late...	1,24...	max-ag...	text/javasc...	opera...							
144	200	HTTPS	www.googletagman...	/tag/sid=AV-6792967...	99,543	private...	application/...	opera...							
145	200	HTTP	Tunnel to	www.googletagmanager...	917		opera...								
146	200	HTTP	Tunnel to	www.googletagmanager...	917		opera...								
147	200	HTTP	Tunnel to	www.googletagmanager...	917		opera...								
148	200	HTTP	Tunnel to	www.googletagmanager...	917		opera...								
149	200	HTTP	Tunnel to	www.googletagmanager...	917		opera...								
150	200	HTTPS	cdn.cs.conductor.com	/scalpel.js	6,804		text/javasc...	opera...							
151	200	HTTPS	www.googletagman...	/tag/sid=UA-5057083...	92,346	private...	application/...	opera...							
152	200	HTTPS	www.googletagman...	/tag/sid=gSNSLN1263...	1,68...	private...	application/...	opera...							
153	200	HTTPS	www.googletagman...	/tag/sid=AV-792937...	99,543	private...	application/...	opera...							
<i>Source: Packet capture by Fiddler tool</i>															

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <hr/> <p>#EXT-X-MEDIA:&lt;attribute-list&gt;</p> <p>The following attributes are defined:</p> <p><b>TYPE</b></p> <p>The value is an enumerated-string; valid strings are <u>AUDIO</u>, <u>VIDEO</u>, <u>SUBTITLES</u>, and <u>CLOSED-CAPTIONS</u>. This attribute is REQUIRED.</p> <p>Typically, closed-caption [<u>CEA608</u>] media is carried in the video stream. Therefore, an EXT-X-MEDIA tag with TYPE of CLOSED-CAPTIONS does not specify a Rendition; the closed-caption media is present in the Media Segments of every video Rendition.</p> <p><b>URI</b></p> <p>The value is a quoted-string containing a URI that identifies the Media Playlist file. This attribute is OPTIONAL; see <u>Section 4.3.4.2.1</u>. If the TYPE is CLOSED-CAPTIONS, the URI attribute MUST NOT be present.</p> <hr/> <p>Pantos &amp; May                      Informational                      [Page 25]</p> <hr/> <p><u>RFC 8216</u>                      HTTP Live Streaming                      August 2017</p> <p><b>GROUP-ID</b></p> <p>The value is a quoted-string that specifies the group to which the Rendition belongs. See <u>Section 4.3.4.1.1</u>. This attribute is REQUIRED.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>
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**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <hr/> <h2 style="margin: 0;"><b>Encode MPEG-2 Transport Stream Segments</b></h2> <p>MPEG-2 transport streams create an arbitrary timestamp when encoding media, using an 33-bit clock that rolls over every 26 hours. For example, if your video starts at the two-hour mark, your audio starts at two hours plus the time for the leading audio. Therefore, a segment of audio that's paired with a segment of video starting at the two-hour mark needs audio that starts at the two-hour mark minus the priming duration. This additional segment ensures the first frame of video plays synchronously with the audio.</p> <h2 style="margin: 0;"><b>Encode Fragmented MPEG-4 Segments</b></h2> <p>The MPEG-4 file format (ISO BMFF) carries the presumption that all track timelines begin with time zero, regardless of whether the timeline is divided into fragments. However, you can set the initial decode time of any fragment to an arbitrary value by means of the Track Fragment Base Media Decode Time Box (tfdt). Use this box to permit the alignment of the audio timeline with the video timeline that places the priming audio prior to the first video frame.</p> <p>Alternatively, starting with iOS 13.1 it's possible to utilize an Edit List Box (elst) within the Track Box (trak) in order to place the duration of the priming audio prior to time 0. This permits a natural alignment of other tracks with audio at time 0. The edit list needs to have a single entry in which the value of media_start is equivalent to the audio priming duration and the value of segment_duration is 0. This is the recommended approach for time alignment for the Common Media Application Format (CMAF).</p>
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**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	<a href="https://developer.apple.com/documentation/http_live_streaming/preparing_audio_for_http_live_streaming">https://developer.apple.com/documentation/http_live_streaming/preparing_audio_for_http_live_streaming</a>

## **NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

### **4.3.4. Master Playlist Tags**

Master Playlist tags define the Variant Streams, Renditions, and other global parameters of the presentation.

Master Playlist tags **MUST NOT** appear in a Media Playlist; clients **MUST** fail to parse any Playlist that contains both a Master Playlist tag and either a Media Playlist tag or a Media Segment tag.

#### **4.3.4.1. EXT-X-MEDIA**

The EXT-X-MEDIA tag is used to relate Media Playlists that contain alternative Renditions (Section 4.3.4.2.1) of the same content. For example, three EXT-X-MEDIA tags can be used to identify audio-only Media Playlists that contain English, French, and Spanish Renditions of the same presentation. Or, two EXT-X-MEDIA tags can be used to identify video-only Media Playlists that show two different camera angles.

Its format is:

```
#EXT-X-MEDIA:<attribute-list>
```

The following attributes are defined:

##### TYPE

The value is an enumerated-string; valid strings are AUDIO, VIDEO, SUBTITLES, and CLOSED-CAPTIONS. This attribute is REQUIRED.

<https://datatracker.ietf.org/doc/html/rfc8216>

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*Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	<p><b><u>3.2. MPEG-2 Transport Streams</u></b></p> <p>MPEG-2 Transport Streams are specified by [<a href="#">ISO 13818</a>].</p> <p><u>The Media Initialization Section of an MPEG-2 Transport Stream Segment is a Program Association Table (PAT) followed by a Program Map Table (PMT).</u></p> <p><u>Transport Stream Segments MUST contain a single MPEG-2 Program; playback of Multi-Program Transport Streams is not defined. Each Transport Stream Segment MUST contain a PAT and a PMT, or have an EXT-X-MAP tag (<a href="#">Section 4.3.2.5</a>) applied to it. The first two Transport Stream packets in a Segment without an EXT-X-MAP tag SHOULD be a PAT and a PMT.</u></p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	<p><b><u>3.3. Fragmented MPEG-4</u></b></p> <p>MPEG-4 Fragments are specified by the ISO Base Media File Format [<a href="#">ISOBMFF</a>]. Unlike regular MPEG-4 files that have a Movie Box ('moov') that contains sample tables and a Media Data Box ('mdat') containing the corresponding samples, an MPEG-4 Fragment consists of a Movie Fragment Box ('moof') containing a subset of the sample table and a Media Data Box containing those samples. Use of MPEG-4 Fragments does require a Movie Box for initialization, but that Movie Box contains only non-sample-specific information such as track and sample descriptions.</p> <p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>

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7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>		
	<p><b><u>URI</u></b></p> <p>The value is a quoted-string containing a <u>URI that identifies the Media Playlist file</u>. This attribute is OPTIONAL; see <a href="#">Section 4.3.4.2.1</a>. If the TYPE is CLOSED-CAPTIONS, the URI attribute MUST NOT be present.</p>		
	:os & May	Informational	[Page 25]
	<a href="#">8216</a>	HTTP Live Streaming	August 2017
	<p><b><u>GROUP-ID</u></b></p> <p>The value is a quoted-string that specifies <u>the group to which the Rendition belongs</u>. See <a href="#">Section 4.3.4.1.1</a>. This attribute is REQUIRED.</p>		
	<p><b><u>LANGUAGE</u></b></p> <p>The value is a quoted-string containing one of the standard Tags for Identifying Languages [<a href="#">RFC5646</a>], which identifies the primary language used in the Rendition. This attribute is OPTIONAL.</p>		
	<p><b><u>ASSOC-LANGUAGE</u></b></p> <p>The value is a quoted-string containing a language tag [<a href="#">RFC5646</a>] that <u>identifies a language that is associated with the Rendition</u>. An associated language is often used in a different role than the language specified by the LANGUAGE attribute (e.g., written versus</p>		

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*Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	<a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328**

*Preliminary charts based on best available information*

**AUDIO**

The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is AUDIO. It indicates the set of audio Renditions that SHOULD be used when playing the presentation. See [Section 4.3.4.2.1](#).

The AUDIO attribute is OPTIONAL.

**VIDEO**

The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is VIDEO. It indicates the set of video Renditions that SHOULD be used when playing the presentation. See [Section 4.3.4.2.1](#).

The VIDEO attribute is OPTIONAL.

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HTTP Live Streaming

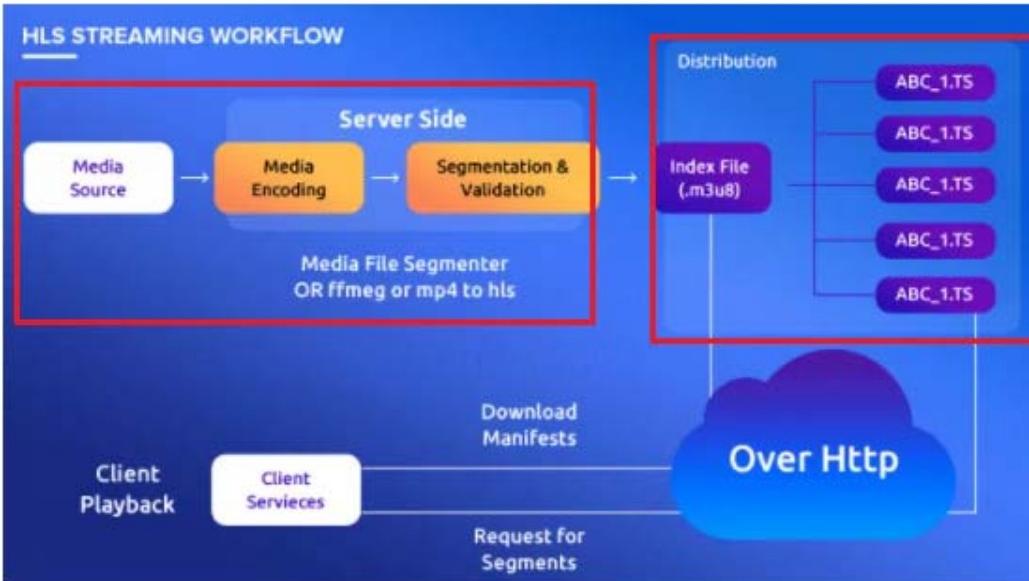
August 2017

**SUBTITLES**

The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is SUBTITLES. It indicates the set of subtitle Renditions that can be used when playing the presentation. See [Section 4.3.4.2.1](#).

The SUBTITLES attribute is OPTIONAL.

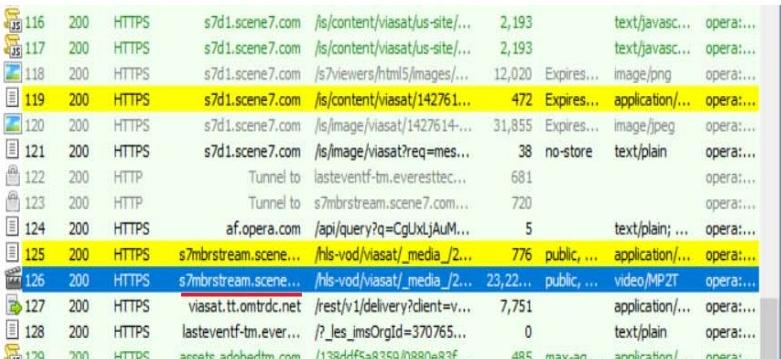
**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
	<p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>
and forwarding the packet streams for transmission in a transmission channel,	<p>The accused standard discloses forwarding the packet streams (e.g., m3u8 data packet stream) for transmission in a transmission channel (e.g., wired/wireless transmission).</p>  <p>The diagram illustrates the HLS Streaming Workflow. It starts with a 'Media Source' which feeds into a 'Server Side' process. This process consists of three sequential steps: 'Media Encoding', followed by 'Segmentation &amp; Validation', and finally 'Media File Segmenter OR ffmpeg or mp4 to hls'. The output of this server-side process is an 'Index File (.m3u8)' which contains a list of 'ABC_1.TS' segments. This index file is then distributed to a 'Client Playback' unit, which also interacts with 'Client Services'. The distribution is labeled 'Over Http'.</p> <p><a href="https://martech.zone/http-live-streaming-player-features/">https://martech.zone/http-live-streaming-player-features/</a></p>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
	<p>HLS supports the following:</p> <ul style="list-style-type: none"> <li>• Live broadcasts and prerecorded content (<u>video on demand, or VOD</u>)</li> <li>• <u>Multiple alternate streams at different bit rates</u></li> <li>• Intelligent switching of streams in response to network bandwidth changes</li> <li>• <u>Media encryption and user authentication</u></li> </ul> <p>The following figure shows the components of an HTTP Live Stream.</p> <pre> graph LR     AV[AV Inputs] --&gt; Server[Server]     subgraph Server [Server]         direction TB         ME[Media encoder] --&gt; SS[Stream segmenter]         SS --&gt; fMP4[fMP4 file]     end     fMP4 --&gt; OS[Origin web server]     subgraph Distribution [Distribution]         direction TB         OS --&gt; Index[Index file]         OS --&gt; MP4[.mp4]         Index --&gt; MP4     end     MP4 --&gt; HTTP[HTTP]     HTTP --&gt; Client[Client]     </pre> <p><a href="https://developer.apple.com/documentation/http_live_streaming">https://developer.apple.com/documentation/http_live_streaming</a></p>
and wherein the mapping further	The accused standard discloses wherein the mapping further comprises assigning a specific value (e.g., value corresponding to different media stream) to each component for a predefined field of a packet (e.g., segment info)

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>																																					
<p>comprises assigning a specific value to each component for a predefined field of a packet according to a second communication protocol, the specific value distinguishing the component from other components, and</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="7">Request Headers</th> </tr> </thead> <tbody> <tr> <td colspan="7">GET /hls-vod/viasat/_media/_2c9/2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4Frag1Num0.ts HTTP/1.1</td> </tr> <tr> <th colspan="7">Security</th> </tr> <tr> <td>Origin: https://www.viasat.com</td> </tr> <tr> <td>sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99"</td> </tr> <tr> <td>sec-ch-ua-mobile: ?0</td> </tr> <tr> <td>sec-ch-ua-platform: "Windows"</td> </tr> <tr> <td>Sec-Fetch-Dest: empty</td> </tr> <tr> <td>Sec-Fetch-Mode: cors</td> </tr> <tr> <td>Sec-Fetch-Site: cross-site</td> </tr> <tr> <th colspan="7">Transport</th> </tr> <tr> <td>Connection: keep-alive</td> </tr> <tr> <td>Host: s7mbrstream.scene7.com</td> </tr> </tbody> </table>	Request Headers							GET /hls-vod/viasat/_media/_2c9/2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4Frag1Num0.ts HTTP/1.1							Security							Origin: https://www.viasat.com	sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99"	sec-ch-ua-mobile: ?0	sec-ch-ua-platform: "Windows"	Sec-Fetch-Dest: empty	Sec-Fetch-Mode: cors	Sec-Fetch-Site: cross-site	Transport							Connection: keep-alive	Host: s7mbrstream.scene7.com	<p>according to a second communication protocol (e.g., HTTP/Hypertext transfer protocol), the specific value (e.g., value corresponding to different media stream) distinguishing the component from other components.</p> <p>As shown below, the accused standard provides m3u8 index file with multiple media playlists. Each media playlist has many representations, wherein every representation has many segments, these segments contains media information of each conversion corresponding to that media playlist.</p> <p>The accused standard provides each segment having information related to a particular HTTP based uniform resource locator for getting a media stream from that particular address.</p> <p>For the video segment shown below, the base URL is <a href="https://s7mbrstream.scene7.com/">https://s7mbrstream.scene7.com/</a> and the specific value is “hls-vod/viasat/_media/_2c9/2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4Frag1Num0.ts” (http based).</p>
Request Headers																																						
GET /hls-vod/viasat/_media/_2c9/2c90a560-78fc-4d3f-ba46-e6b941852d50.mp4Frag1Num0.ts HTTP/1.1																																						
Security																																						
Origin: https://www.viasat.com																																						
sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99"																																						
sec-ch-ua-mobile: ?0																																						
sec-ch-ua-platform: "Windows"																																						
Sec-Fetch-Dest: empty																																						
Sec-Fetch-Mode: cors																																						
Sec-Fetch-Site: cross-site																																						
Transport																																						
Connection: keep-alive																																						
Host: s7mbrstream.scene7.com																																						

*Source: Packet capture by Fiddler tool*

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7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
	<p><b>Request Headers</b> <span style="float: right;">[ Raw ] [ Header Details ]</span></p> <pre>GET /is/content/viasat/1427614-%20Shield%20Premium%20with%20Antivirus%20GTM_final_v1-AVS.m3u8 HTTP/1.1</pre> <p><b>Client</b></p> <pre>Accept: */* Accept-Encoding: gzip, deflate, br Accept-Language: en-US,en;q=0.9 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.45 Safari/537.36 OPR/82.0.4227.23</pre> <p><b>Security</b></p> <pre>Origin: https://www.viasat.com sec-ch-ua: "Chromium";v="96", "Opera";v="82", ";Not A Brand";v="99" sec-ch-ua-mobile: ?0 sec-ch-ua-platform: "Windows" Sec-Fetch-Dest: empty Sec-Fetch-Mode: cors</pre> <p><i>Source: Packet capture by Fiddler tool</i></p>

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

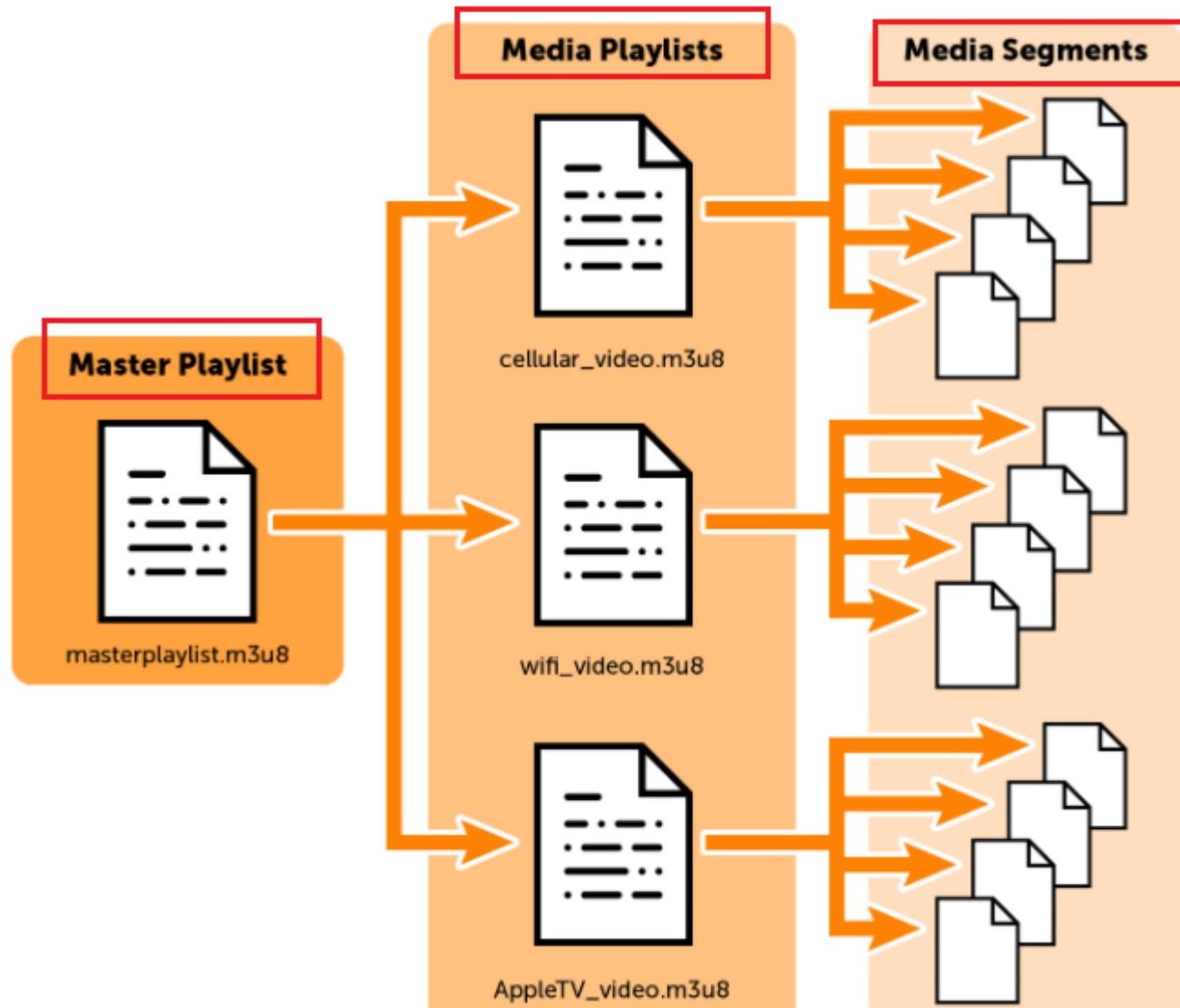
Request Headers												[Raw]	[Header Definition]
Transformer	Headers	Text View	Syntax View	Image View	Hex View	Web View	Auth	Caching	Cookies	Raw	JSON	XML	
00000000	48 54 54 50 2F 31 2E 31 20 32 30 30 20 4F 4B 0D 0A 43 6F 6E 74 65 6E 74 2D	HTTP/1.1 200 OK..Content-											
00000019	54 79 70 65 3A 20 76 69 64 65 6F 2F 4D 50 32 54 0D 0A 43 6F 6E 74 65 6E 74	Type: video/MP2T..Content											
00000032	2D 4C 65 6E 67 74 68 3A 20 32 33 32 32 35 35 32 0D 0A 4C 61 73 74 2D 4D 6F	-Length: 2322552..Last-Mo											
00000048	64 69 66 69 65 64 3A 20 54 68 75 2C 20 32 39 20 4A 75 6C 20 32 30 32 31 20	dified: Thu, 29 Jul 2021											
00000064	32 30 3A 32 38 3A 33 32 20 47 4D 54 0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74	20:28:32 GMT..Access-Cont											
0000007D	72 6F 6C 2D 41 6C 6C 6F 77 2D 4F 72 69 67 69 6E 3A 20 2A 0D 0A 58 2D 43 61	rol-Allow-Origin: *.X-Ca											
00000096	63 68 65 2D 48 69 74 73 3A 20 30 0D 0A 41 63 63 65 70 74 2D 52 61 6E 67 65	che-Hits: 0..Accept-Range											
000000AF	73 3A 20 62 79 74 65 73 0D 0A 53 74 72 69 63 74 2D 54 72 61 6E 73 70 6F 72	s: bytes..Strict-Transpor											
000000C8	74 2D 53 65 63 75 72 69 74 79 3A 20 6D 61 78 2D 61 67 65 3D 33 31 35 33 36	t-Security: max-age=31536											
000000E1	30 30 30 3B 20 69 6E 63 6C 75 64 65 53 75 62 44 6F 6D 61 69 6E 73 0D 0A 43	000; includeSubDomains..C											
000000FA	61 63 68 65 2D 43 6F 6E 74 72 6F 6C 3A 20 70 75 62 6C 69 63 2C 20 6E 6F 2D	ache-Control: public, no											
00000113	74 72 61 6E 73 66 6F 72 6D 2C 20 6D 75 73 74 2D 72 65 76 61 6C 69 64 61 74	transform, must-revalidat											
0000012C	65 2C 20 70 72 6F 78 79 2D 72 65 76 61 6C 69 64 61 74 65 2C 20 6D 61 78 2D	e, proxy-revalidate, max-											
00000145	61 67 65 3D 35 33 37 38 33 35 0D 0A 45 78 70 69 72 65 73 3A 20 54 68 75 2C	age=537835..Expires: Thu,											
0000015E	20 31 36 20 44 65 63 20 32 30 32 31 20 30 39 3A 35 30 3A 33 34 20 47 4D 54	16 Dec 2021 09:50:34 GMT											
00000177	0D 0A 44 61 74 65 3A 20 46 72 69 2C 20 31 30 20 44 65 63 20 32 30 32 31 20	..Date: Fri, 10 Dec 2021											
00000190	30 34 3A 32 36 3A 33 39 20 47 4D 54 0D 0A 43 6F 6E 66 63 74 69 6F 6E 3A	04:26:39 GMT..Connection:											
000001A9	20 6B 65 65 70 2D 61 6C 69 76 65 0D 0A 0D 0A 47 40 00 10 00 00 B0 0D 00 01	keep-alive....G@...."											
000001C2	C1 00 00 00 01 E1 00 E8 F9 5E 7D FF	Á...á.èù")ÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
000001DB	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
000001F4	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
0000020D	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
00000226	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
0000023E	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
00000258	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
00000271	FF FF FF 47 41 00 10 00 02 B0 17 00 01 C1 00 00 E1 01 F0 00 1B E1 01 F0 00	ÿÿÿGA...".Á..á..á..á..											
0000028A	0F E1 02 F0 00 9E 28 C6 DD FF	.á..á..(Éÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
000002A3	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
000002BC	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
000002D5	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											
000002EE	FF	ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ											

**NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328***Preliminary charts based on best available information*

7,848,328	ViaSat (“Accused Instrumentality”)
	<p><i>Source: Packet capture by Fiddler tool</i></p> <pre> graph LR     IF[Index File.m3u8] --&gt; ALI[Alternate-Low Index]     IF --&gt; AMI[Alternate-Mid Index]     IF --&gt; AHI[Alternate-Hi Index]     ALI --&gt; L01[Low_01.ts]     ALI --&gt; L02[Low_02.ts]     ALI --&gt; L03[Low_03.ts]     ALI --&gt; L04[Low_04.ts]     AMI --&gt; M01[Mid_01.ts]     AMI --&gt; M02[Mid_02.ts]     AMI --&gt; M03[Mid_03.ts]     AMI --&gt; M04[Mid_04.ts]     AHI --&gt; H01[Hi_01.ts]     AHI --&gt; H02[Hi_02.ts]     AHI --&gt; H03[Hi_03.ts]     AHI --&gt; H04[Hi_04.ts]   </pre> <p><b>Figure 1.</b> HLS uses multiple encoded files with index files directing the player to different streams and chunks of audio/video data within those streams.</p> <p><a href="https://www.streamingmedia.com/Articles/Editorial/What-Is-.../What-Is-HLS-(HTTP-Live-Streaming)-78221.aspx?utm_source=related_articles&amp;utm_medium=gutenberg&amp;utm_campaign=editors_selection">https://www.streamingmedia.com/Articles/Editorial/What-Is-.../What-Is-HLS-(HTTP-Live-Streaming)-78221.aspx?utm_source=related_articles&amp;utm_medium=gutenberg&amp;utm_campaign=editors_selection</a></p>

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<https://www.wowza.com/blog/hls-streaming-protocol>

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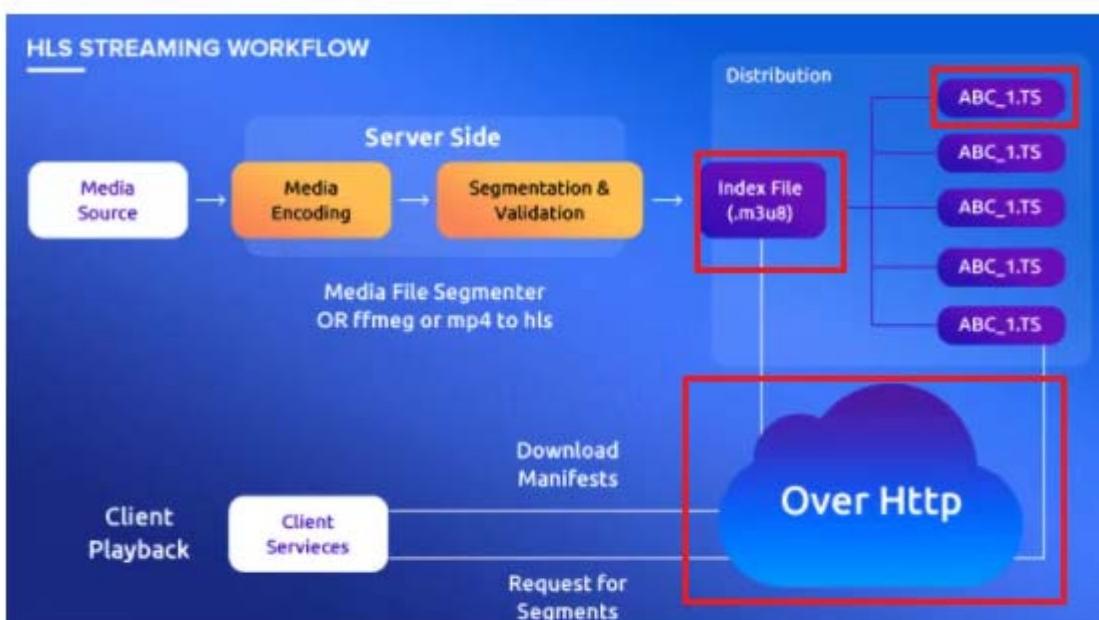
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7,848,328	<b>ViaSat (“Accused Instrumentality”)</b>
	<p><b><u>8.3. Playlist with Encrypted Media Segments</u></b></p> <pre>#EXTM3U #EXT-X-VERSION:3 #EXT-X-MEDIA-SEQUENCE:7794 #EXT-X-TARGETDURATION:15  #EXT-X-KEY:METHOD=AES-128,URI="<a href="https://priv.example.com/key.php?r=52">https://priv.example.com/key.php?r=52</a>"  #EXTINF:2.833, <a href="http://media.example.com/fileSequence52-A.ts">http://media.example.com/fileSequence52-A.ts</a> #EXTINF:15.0, <a href="http://media.example.com/fileSequence52-B.ts">http://media.example.com/fileSequence52-B.ts</a> #EXTINF:13.333, <a href="http://media.example.com/fileSequence52-C.ts">http://media.example.com/fileSequence52-C.ts</a>  #EXT-X-KEY:METHOD=AES-128,URI="<a href="https://priv.example.com/key.php?r=53">https://priv.example.com/key.php?r=53</a>"  #EXTINF:15.0, <a href="http://media.example.com/fileSequence53-A.ts">http://media.example.com/fileSequence53-A.ts</a></pre> <p><b><u>8.4. Master Playlist</u></b></p> <pre>#EXTM3U #EXT-X-STREAM-INF:BANDWIDTH=1280000,AVERAGE-BANDWIDTH=1000000 <a href="http://example.com/low.m3u8">http://example.com/low.m3u8</a> #EXT-X-STREAM-INF:BANDWIDTH=2560000,AVERAGE-BANDWIDTH=2000000 <a href="http://example.com/mid.m3u8">http://example.com/mid.m3u8</a> #EXT-X-STREAM-INF:BANDWIDTH=7680000,AVERAGE-BANDWIDTH=6000000 <a href="http://example.com/hi.m3u8">http://example.com/hi.m3u8</a> #EXT-X-STREAM-INF:BANDWIDTH=65000,CODECS="mp4a.40.5" <a href="http://example.com/audio-only.m3u8">http://example.com/audio-only.m3u8</a></pre>

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	<p><a href="https://datatracker.ietf.org/doc/html/rfc8216">https://datatracker.ietf.org/doc/html/rfc8216</a></p>  <p>The diagram illustrates the HLS Streaming Workflow. On the Server Side, a Media Source feeds into Media Encoding, which then leads to Segmentation &amp; Validation. This process is labeled as using a Media File Segmenter OR ffmpeg or mp4 to hls. The output of Segmentation &amp; Validation is the Index File (.m3u8), which is highlighted with a red box. The Index File then branches down to multiple TS (Transport Stream) segments, also highlighted with red boxes. These segments are labeled ABC_1.TS. On the Client Side, Client Playback and Client Services interact with the segments over HTTP, which is also highlighted with a red box. The Client Services download manifests, and Client Playback requests segments from the Client Services.</p> <p><a href="https://martech.zone/http-live-streaming-player-features/">https://martech.zone/http-live-streaming-player-features/</a></p>
the encapsulating comprises encapsulating the packet streams according to one or more	<p>The accused standard discloses encapsulating comprises encapsulating the packet streams (e.g., data packets in m3u8 file) according to one or more lower layer protocols without encapsulating the packet streams (e.g., data packets in m3u8) according to the second communication protocol (e.g. HTTP Protocol).</p> <p>Further as explained below, the packet streams are encapsulated according to one or more lower layer protocols (e.g., network layer/MAC layer/physical layer) of the device transmitting the packet streams. Since, the packet streams are obtained by TCP encapsulation of data streams and the HTTP protocol doesn't reside beneath the</p>

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<b>7,848,328</b>	<b>ViaSat (“Accused Instrumentality”)</b>
lower layer protocols without encapsulating the packet streams according to the second communication protocol.	<p>TCP layer, the further encapsulation doesn't comprise encapsulation using HTTP protocol (once TCP encapsulation has been executed).</p> <p>In any communication system, when a sender prepares data for sending from its physical interface (e.g., wired/wireless interface of the server/machine), the process of entire “data formulation” or “data construction” has multiple steps, all steps (if they are present) are associated with one layer of OSI model (it's a model which every communication system follows, some specification communication schemes may have lower number of layers (because multiple layers of OSI can be combined into one for those cases). Two lower level layers—data link layer and physical layers are invariably present in any communication system. They are the lowest two layers. They reside beneath the TCP layer. Data link layer ensure error free communication whereas the physical layer processes the data so that it can be sent using the actual medium of communication (e.g., modulation and formatting in wireless/wired communication system)</p>

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	<p><b>Does HLS use TCP or UDP as its transport protocol?</b></p> <p>TCP and UDP are transport protocols, meaning they are responsible for delivering content over the Internet. TCP tends to deliver data more reliably than UDP, but the latter is much faster, even though some data may be lost in transit.</p> <p>Because UDP is faster, some streaming protocols use UDP instead of TCP. <u>HLS, however, uses TCP.</u> This is for several reasons:</p> <ol style="list-style-type: none"><li>1. HLS is over HTTP, and the HTTP protocol is built for use with TCP (with some exceptions).</li><li>2. The modern Internet is more reliable and more efficient than it was when streaming was first developed. In many parts of the world today, user connectivity has vastly improved, especially for mobile connections. As a result, users have enough bandwidth to support the delivery of every video frame.</li><li>3. Adaptive bitrate streaming helps compensate for the potentially slower data delivery of TCP.</li></ol> <p><a href="https://www.cloudflare.com/learning/video/what-is-http-live-streaming/">https://www.cloudflare.com/learning/video/what-is-http-live-streaming/</a></p>

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7,848,328	<p style="text-align: center;"><b>ViaSat (“Accused Instrumentality”)</b></p> <p><b>HyperText Transfer Protocol (HTTP)</b></p> <p>The HyperText Transfer Protocol, or <i>HTTP</i>, must be the most widely used Application layer protocol in the world today. It forms the basis of what most people understand the Internet to be—the World Wide Web. Its purpose is to provide a lightweight protocol for the retrieval of HyperText Markup Language (<i>HTML</i>) and other documents from Web sites throughout the Internet. Each time you open a Web browser to surf the Internet, you are using <i>HTTP</i> over <i>TCP/IP</i>.</p> <p><i>HTTP</i> was first ratified in the early 1990s and has been through three main iterations:</p> <ul style="list-style-type: none"> <li>• <i>HTTP/0.9</i>: A simplistic first implementation of the protocol that only supported the option to get a Web page.</li> <li>• <i>HTTP/1.0</i>: Ratified by the <i>IETF</i> as RFC 1945 in 1996. This version added many supplemental data fields, known as <i>headers</i> to the specification. This allowed for other information passing between the client and server, alongside the request and consequent page.</li> <li>• <i>HTTP/1.1</i>: Defined in RFC 2616 by the <i>IETF</i>, version 1.1 implemented a number of improvements over and above the 1.0 specification. One of the main improvements of 1.1 over 1.0 was the implementation of techniques such as persistent <i>TCP</i> connections, pipelining, and cache control to improve performance within <i>HTTP</i>-based applications.</li> </ul> <p><a href="https://www.informit.com/articles/article.aspx?p=169578">https://www.informit.com/articles/article.aspx?p=169578</a></p>
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	<p>Upper and Lower layers further divide network architecture into seven different layers as below</p> <ul style="list-style-type: none"> <li>• Application</li> <li>• Presentation</li> <li>• Session</li> <li>• Transport</li> <li>• Network, Data-link</li> <li>• Physical layers</li> </ul> <div style="text-align: right; margin-top: -20px;"> <span style="border: 1px solid red; padding: 2px;">HTTP resides at application layer</span> </div> <p style="text-align: center;">© guru99.com</p> <p style="text-align: center;">Network Layers Diagram</p> <p style="text-align: center;"><a href="https://www.guru99.com/layers-of-osi-model.html">https://www.guru99.com/layers-of-osi-model.html</a></p> <p style="text-align: center;"><a href="https://www.cloudflare.com/learning/ddos/glossary/open-systems-interconnection-model-osi/">https://www.cloudflare.com/learning/ddos/glossary/open-systems-interconnection-model-osi/</a></p>

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